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The Standard Cooker.

THE outstanding feature of the I.M.E.A. Convention this year undoubtedly was, as the President, Mr. J. K. BRYDGES, stated, the exhibition for the first time of the British standard electric cooker.

This exhibit was in the nature of a surprise item, although it had been anticipated for some time previously that publication of the result of the labours of the joint committee preparing the specification would not long be delayed. The joint committee referred to was formed on the initiative of the I.M.E.A., and consists of representatives of municipal and company supply undertakings, manufacturers, and consumers.

Whether we regard the B.S.C. as the quintessence of all talents or merely as a first draft that is capable of improvement, there is one thing that is quite certain. The production of the B.S.C. does represent a very considerable step forward in the direction of providing simple and reliable apparatus of standardised construction which can be sold at a relatively low price. Added to this is the important factor in popularising electric cooking, that parts can be replaced promptly and inexpensively. Combined action by electrical manufacturers comes none too soon to meet the challenge of recent developments in gas cookers, also a result of the pooling of experience. In face of the needs of the situation, the commercial advantages of the B.S.C., in our opinion, easily outweigh the omission of technical points which individual manufacturers may, perhaps rightly, regard as superior in their own specialised designs.

In the continuation of our report of the exhibits this week we give some details from the published specification. The particulars which appeared to us from an inspection of the cooker to be of most general interest are: a high oven loading, the use of side and bottom heat, the cutting away of the back half of the lining top, the wide sweep of the oven corners, the open vent pipe at the back, the situation of the grill

in the centre, and the fact that "medium" heat means full heat to the centre part of the grill. There seems to be more room for dishes in the grill chamber, and in the oven itself a more liberal allowance of runners than in other types. The round hot-plates are interchangeable. Some of these features appear to us to be improvements, but others were adversely criticised. Whatever may be thought about constructional details, these do not strike us as the most significant aspect of the B.S.C. The main point is that manufacturers of upwards of nine-tenths of the electric cookers made to-day have sunk quite obvious differences of opinion on what constitutes the ideal technical design and have agreed to the compromise requisite for mass-production of a commercial article. The situation to be met is certainly easier than it was when we advocated (in February, 1915) the corporate action which is now being taken. The one outstanding necessity for success is the support of the electricity supply undertakings. We have every confidence that this support will be forthcoming for the model as finally approved. The joint committee will meet again very shortly under the chairmanship of Mr. C. G. Morley New to consider possible improvements in design. We suggest that engineers who have constructive criticism to offer should communicate as early as possible with the joint committee.

The Committee-Man.

Considered from the non-technical standpoint, the paper by Alderman Chatfield was perhaps the most interesting read at Eastbourne. What could be more fitting than that the qualifications necessary for the perfect man on a municipal electricity committee should be read by one of themselves? What engineer would have had the courage and the humour to attempt to express himself in public and with candour regarding so closely related a lay member of his council, what he should know and exactly what he ought to be? We have known engineers to express opinions regarding each other, and councillors regarding fellow-councillors, both privately and publicly. But that undertaking is likely to benefit most whose committee chairman and engineer have a David and Jonathan regard for each other and are inspired by one common aim or purpose and that the progressive commercial and technical efficiency of their system. The idea that the President's own chairman should select as his theme the obligations of electricity committees to their undertakings was a particularly happy one. His remarks were so directly to the point and so up-to-date, that they deserve to be studied by every municipal committee-man whether electrical or otherwise. They are abstracted on another page in this issue, and we hope that all engineers and chairmen, whether they were present or not at the Convention, will tactfully bring the paper to the notice of their entire committees and, also tactfully, secure sympathetic attention from their non-electrical committees. If this happens we may look for a substantial advance in general efficiency in municipal life. Alderman Chatfield's "perfect man," unlike so many committee-men, takes his responsibilities seriously to heart, fully recognises his obligations, and aims selflessly to bring about the success of his council's electrical undertakings by keeping himself informed regarding every new movement or development calculated to distribute (and sometimes produce also) electricity cheaply for everybody without piling up profits to satisfy the voracious appetite of the income tax collector. We have always had in the I.M.E.A. some splendid examples of what a chairman of an electricity committee should be. With many more of them, executed to the Chatfield design, operating in all parts of the country, we could look for a much faster rate of electricity supply progress, because there would be a better understanding of essential points and a cordial co-operation with the engineer and manager.

Cable Research.

The theme of the article by Mr. C. J. Beaver, which is concluded in this issue, is that the remarkable advance in the technique of cable manufacture that has been so noticeable of late years is due to the interaction of two main influences.

The first is the increase in the demands of the user, by reason of the higher voltages necessary for transmitting the greater loads of to-day, and also the more exacting conditions of service due to the growing diversity of the uses of electricity. The second influence is improvement in research facilities due to a pooling of experience which has led not only to the avoidance of overlapping of research work but also to the establishing of a correct relationship between physical and electrical requirements.

We think Mr. Beaver's claim that the cable-making art is being rapidly raised to higher levels is one that can be easily substantiated. We have only to recall the common sardonic references to 33-kV cables a very few years ago to realise the amount of thought that has been devoted to making the super-voltage cable of to-day a really practicable means of transmitting electricity.

Electrical Refrigeration.

The swift changes in our weather make it very difficult for the industry to launch its "campaigns" at an auspicious moment, but E.D.A. was fortunate enough to announce its special electrical refrigeration effort just as a warm spell set in. Moreover, the Association timed its campaign so as to secure the attention of the members of the I.M.E.A. at their annual convention, a fact which should make a substantial contribution to the success of the campaign.

A special window display has been designed for the purposes of the campaign; this was illustrated in our last issue. In our "Business Notes" to-day we give some further particulars of the assistance which E.D.A. offers to retailers of refrigerators and other interested parties.

There is undoubtedly a tremendous scope in this country for the electrical refrigerator, and the Americans were early to take advantage of it. Exports of refrigerators from the United States have gone up by leaps and bounds in the last year or two and a goodly proportion of them have come to this country.

E.D.A. shows, however, that there are several British makers of refrigerators. These are not all as well known to the public—or even to the trade—as they might be. This is surely one direction in which the purchaser should be asked to "Buy British."

We must conclude by taking the Association to task for a statement made in its booklet E.D.A. 779. This is that "the greatest household aid the 20th Century has produced is the British electrical refrigerator." Much can be said in favour of the refrigerator, but we think that there are other electrical appliances with a better claim to this title.

The I.E.E. in Ireland.

The summer meeting of the Institution of Electrical Engineers, which was held in Ireland at the invitation of the Committee of the Irish Centre, ends to-night with a dinner and dance in Belfast. About 200 people took part in the visit. In our issue of May 16th we gave preliminary particulars of the programme, and we propose as usual to report the proceedings. This week we conclude our description of the Shannon hydro-electric scheme which was to be the principal technical attraction of the meeting. The present instalment deals with the transmission system, which is especially notable for the degree to which standardisation has been carried. At present less than 25 per cent. of the inhabitants of the Irish Free State live in electrically served areas, as compared with about 95 per cent. in Great Britain. This involves the spending of relatively large sums on distribution. Nevertheless, the Shannon Electricity Supply Board expects to be in a position to pay both capital and operation charges in 1931.

Shannon Hydro-electric Scheme.

A descriptive account of the layout and equipment of the initial portion of the Ardnacrusha power plant built by German contractors for the Irish Free State water-power development project.

By CHAS. J. WEBB, A.I.A.E.

(*Concluded from page* 952.)

The 38-kV network has been arranged in such a way that all important towns and the larger villages can be provided with sub-stations to step down the incoming voltage to 10 kV. Altogether there will be sixty-six 38/10-kV sub-stations, all single-storey buildings. Pro-

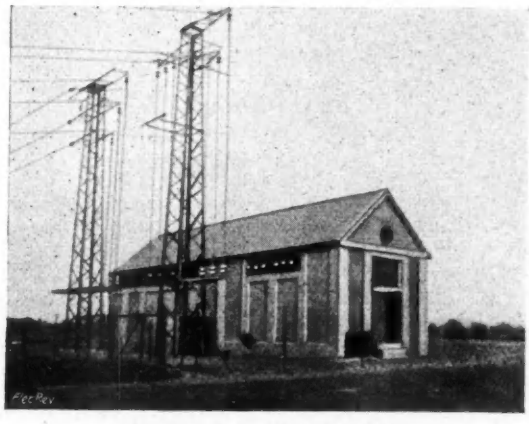


Fig. 17.—Typical Sub-station.

vision has been made to facilitate future extensions at each by using two standard compartments only, which can be put together in such a way as to obtain five different arrangements of transformer stations (fig. 17). In order to avoid the condensation of water in the interior of the transformer stations a double wall with an air space between is provided, this precaution being particularly necessary in view of the damp Irish climate. To ensure the efficient ventilation of the buildings special hinged coverings are arranged at the gable ends. Compartments are located on both sides of the service gangway, separated from one another by grillwork screens only. Each compartment has an oil trough and draining pipe; the 38-kV and 10-kV single systems of busbars, separated from one another by screens, are above the gangway and the breakers are mounted on rollers so that they can be easily drawn in and out of their compartments.

As regards electrical equipment, three types of station have been provided. "Head" stations at the ends of feeder lines, branched off from the 38-kV overhead transmission network, merely serve to reduce the voltage from 38 to 10 kV for the distribution system; on the 38-kV side, the stations have only one incoming overhead line feeder, fitted with overload protection only. "Through" stations have two 38-kV feeders and cut out a faulty part of the 38-kV overhead distribution system in case of a short circuit on the line, without affecting the working of the remainder of the network; the earth-fault relays actuate drop communicators which indicate in each station the direction in which the fault has occurred. "Junction" stations are equipped exactly the same as "through" stations, the only difference being that they take more than two 38-kV overhead lines.

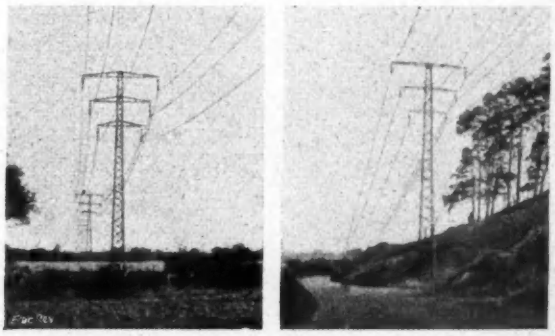
The layout of the buildings was materially simplified by the use of outdoor transformers with capacities ranging from 100 to 500 kVA, of the self-cooling core type with a ratio of plus or minus 5 per cent., 37,500/10,000 V, star/star connected, so complying with the requirements of the Irish Government of interchangeability of the transformers of the different stations. By means of a switch on the cover the tapping may be changed while the transformer is dead; on the higher-voltage side are oil-circuit breakers and isolating links.

All measuring instruments and protective relays are accommodated on a standard sheet-steel switchboard located in a separate compartment next to the main entrance.

The comparatively low height of the buildings necessitates in all instances the provision of a lattice pole in proximity to the station capable of withstanding the entire strain of the line. Adequate fencing of the sites of the transformer stations is required to avoid unauthorised trespassing, especially in view of the fact that the transformers are mounted outdoors and that the overhead transmission lines come in at a height of only 10 ft. 6 in. By the standardisation of the sub-stations of the 38-kV network only five fundamental types were necessary for the construction of the whole 55 or more stations.

Loop Distribution.

The 38-kV transmission system has been arranged for loop distribution. The total length of 38-kV lines when



Figs. 18 and 19.—Twin-circuit 110- and 38-kV Lines.

fully completed will be approximately 1,040 miles, the four loops being: No. 1—Ardnacrusha, Waterford, Cord, Mallow, Tralee, Killarney, and Ardnacrusha. No. 2—Ardnacrusha, Ennis, Galway, Swinford, Boyle, Mohill, Athlone, Maryborough, and Ardnacrusha. No. 3—Mohill, Cavan, Ardee, Ashbourne, and Dublin. No. 4—Dublin, Wexford, Waterford, Carlow, Mary-

borough, and Dublin. A number of sub-stations connected to the 38-kV lines have been erected at which the power is transformed for local distribution at 10,000/380/220 V to towns and villages by means of wood-pole overhead lines.

Transmission Lines.

The 110-kV lines, which consist of three 95 sq. mm. conductors, are supported entirely on lattice steel masts, similar masts being used for the 38-kV conductors in the southern area and wooden masts in the northern area. For the 10-kV lines wooden masts are used exclusively. The 38-kV lines comprise three conductors, except in a few special cases in which two lines closely approach each other, the twin lines being supported on the same mast. In almost all cases the conductors are hard-drawn copper of an ultimate tensile strength of over 25 tons per sq. in. The cross-sectional area of the copper is 50 sq. mm. for the 38-kV lines. Bronze conductors are employed for long spans.

The 110-kV lines are supported by seven-unit (porcelain) insulator chains, two-unit chains being employed for the 38-kV lines. The large insulator chains are designed for dry flash-over at 450 kV and the small ones at 150 kV, and for wet flash-overs at 338 and 123 kV, respectively. Where the lines pass over public roads additional safety is secured by the use of an additional insulator in the chains, while where they pass over railways, canals, and navigable rivers double suspension and strain chains of eight insulators each are used for the 110-kV lines and of three insulators each in the case of the 38-kV lines.

The jointing of the conductors is effected by means of grooved connectors (fig. 20). In the case of the 110-kV

Fig. 20.—Notched Cable Connector.

lines the maximum span is 820 ft. and in that of the 38-kV lines approximately 656 ft. The standard masts of the 38-kV lines stand approximately 47½ ft. above the ground and are imbedded to the extent of 6½ ft.; those of the 110-kV six-conductor lines are 76 ft. in height, of which 8 ft. 2 in. is in the ground. At intervals of not more than 1⅞ miles strain poles specially designed to support two-thirds of the greatest tension on one pole side are used, the intervals being usually further subdivided by crossing or angle poles. A line on one side of a branching pole is made up of two three-phase circuits, while on the other side it branches into two separate three-phase circuits going in different directions.

Crossings over railways, communication lines, canals or navigable waterways, have been constructed with the shortest possible spans between the poles. The minimum clearance between power and communication lines is 6 ft. on the 38-kV lines and 9 ft. on the 110-kV lines. The distance between the lowest point of the conductors and the railway level is 22 ft. 11 in. on both the 110-kV and 38-kV lines. A clearance of 22 ft. 11 in. is left over ordinary canals, while that over the River Suir, a navigable river near Waterford, is 150 ft. For extra long spans poles have been erected having a height up to 164 ft. above ground level, as in the case of the 38-kV crossing over the River Suir where there is a span of 1,541 ft. One interesting crossing is that over the River Barrow at New Ross where two spans exist, one over the river having a length of 1,223 ft. and the other over a railway being 820 ft. in length; the central crossing pole stands in boggy and swampy ground on a bearing foundation constructed on 36 large wooden piles driven into the ground to a depth of 41 ft. Certain crossings of 110-kV lines over 38-kV lines have been constructed in the same manner as railway crossings; the conductors pass over one another with the prescribed minimum clearance of 16 ft. 4 in. between the lowest 110-kV conductors and the highest 38-kV lines. In fulfilment of this condition, for instance, poles near Athy on the Dublin-Limerick 110-kV line crossing the 38-kV line have a height of 92 ft. above ground.

The conductors are so transposed that, at stated intervals, each conductor changes its position on two transposition poles in the same order and at practically the same distances; such intervals on the 110-kV 6-conductor lines are 25 miles, and on the 38-kV three-phase lines 50 miles.

Conclusion.

The constructional cost of the Shannon scheme is estimated at £6,000,000 with a further £2,000,000 for the distribution network. It has been estimated that when fully completed the capacity of the plant will suffice for the electricity requirements of the Free State for the next 100 years. At present only about 700,000 of the population of 3,000,000 inhabitants live in districts where supplies of electricity are available, but gradually every town and village with a population of more than 500 persons will be supplied.

In a statement issued early in March last Dr. McLaughlin, managing director of the Shannon Electricity Supply Board, stated that the Board was then providing 98 per cent. of the electricity which was being used in the Irish Free State, and that in view of the growing demand it was expected that by 1932 at the latest the whole output of the existing installation would be absorbed. He further announced that the Board was confident of being able to pay out of its earnings in 1931 all interest, sinking-fund charges, and working expenses.

Future of Electricity Supply.

In an article in the *Daily Chronicle*, Sir Harry Haward, who recently retired from the office of Electricity Commissioner, discusses the present and future positions of electricity supply in this country. Referring to the national grid scheme of the Central Electricity Board, he says that the success of the scheme will depend in the last resort upon the demand for electricity. Last year over 8,500 million kWh were sold in this country by authorised undertakers, an increase of 13 per cent. on the sales for 1928.

Factories, workshops, and mines are being increasingly electrified, and cheaper and more easily available power supplies will induce transfers from steam and private electrical plants to the public mains. The traction load will grow with the further electrification of suburban railways, and a Committee, under the presidency of Lord Weir, is now engaged in investigating the question of electrifying the railway main lines. But it is to the domestic demand that we must look for great and rapid development. The efforts of the British Electrical Development Association in this direction are beginning to bear fruit, but much greater enterprise needs to be shown by supply authorities up and down the country in the cultivation of the domestic demand. The problem of supplies in the rural areas has yet to be solved. Over 4,000 miles of mains had, at March 31st, 1929, been laid in some 1,600 parishes in the rural districts of Great Britain, but in 12,000 parishes no supplies were available. The development of village industries will be fostered by cheap power supplies; for example, in a number of villages along the valley of the Stour in Worcestershire water power gave way to steam, which has now been displaced by electricity.

Technical Training in Russia.

An account of the research work carried out in Leningrad institutes, which maintain close relations with industry and the State.

By J. G. CROWTHER.

The Electrotechnical Institute.

THIS Institute trains students for the practice of electrical engineering. Over two thousand students are on the register, and all have to pass a fairly stiff entrance examination. For instance, if there are a hundred vacancies, there may be five hundred candidates for them. Of the five hundred, perhaps two hundred will pass the examination. A hundred of these are selected. Children of scientists have a specially good chance of being included in the selection, while those of commercial people have no chance, or only a poor one, of being included. Owing to the entrance examination, the students have been well seeded. Most of them, say 80 per cent. or more, complete the course, and are then qualified electrical engineers.

The vice-principal of the Institute is Prof. Egiazaroff, who was a student at Vickers' Old Trafford works in 1913 and learnt English at a Liverpool school. He is conducting important researches into the design of hydro-electric power stations. One of the most important of these researches is in regard to the phenomenon that when water runs over a weir, the water-level in the pool is a little higher than the water as it curls over the weir. This is due to the "negative wave," as it is called, which exerts a back pressure on the water in the pool and dams it up. The strength of the negative wave depends on the rate at which water is drawn from behind the weir or dam; hence the difference between the water-level in the pool and the top of the water as it swirls over the weir, or through a sluice, is controlled by the rate water is drawn from the pool. The importance of this matter with reference to hydro-electric power stations can easily be grasped. Hydro-electric power stations have to produce varying quantities of electricity at different times of the day, so they will consume quantities of water from the dam at varying rates. The strength of the "negative wave" will vary, and hence the difference between the general water level in the dam and the level of the top of the water as it runs through the sluices. In very large plants the difference in level may amount to five feet. A layer of water five feet thick and of an area equal to that of the dam, perhaps thousands of acres, may be supported by this hydraulic phenomenon. It is clear that accurate knowledge of so large an effect must be important in large hydro-electric power station design. It has been found that the theories of the action, based on the researches of Osborne Reynolds and others, do not fit the observed data, so Prof. Egiazaroff has investigated the problem experimentally.

Another investigation of the same type concerns the silting of water channels. Water has often to be conducted through channels to turbo-generators, and these channels become silted up. It is important to understand the variation in the silting effect due to the variation in the rate of the passage of water through the channel, since this rate is again related to the varying consumption of the electricity from the plant at different times of the day. Another investigation concerns the behaviour of water running down a vertical shaft, and the conditions determining the maximum rate.

Prof. Egiazaroff is a consultant for what is believed to be the largest projected hydro-electric power plant in Europe. This is being erected at Volkov, on the Dnieper, and will develop 700,000 h.p. when completed.

The organic relations between the technical Institution, industry, and the State are impressive. All three work together in a way which appears to contrast favourably with that in which the three interact in England. The three important activities tend to be conducted with excessive independence in England, where industry, technical education, and the State sometimes rather jealously keep too much to themselves, to their mutual disadvantage. In Russia the position is different, and one feels that, opportunity for opportunity, the Russian system, which is an extreme form of the German and continental one, will achieve more.

Other interesting researches in this Institute are Dr. Kasyroff's on a new photo-electric cell, useful in "talkie" technique.

Dr. Denissoff has been investigating the phenomena of the removal of gas in the manufacture of gasfilled lamps. He is coming to England shortly to discuss his results with the research workers on the same subject in the G.E.C. laboratory at Wembley. He has discovered that the admixture of sodium silicate and red phosphorous improves the rate of the removal of the gas when the lamp bulbs are being exhausted.

Other researches concern the measuring of the temperature of the filaments of gasfilled lamps. The temperature of the filament, about 2,400 deg. C., can now be measured to within about 5 deg. C. An experimental reseach on the rate of thermal molecular flow is in progress, and results differ from those calculated by standard formulæ.

A large shed has been cleared for a 1,000,000-V transformer, which has been ordered from the G.E.C. of America. This transformer will be used for testing the insulators for supporting the lines distributing power from the many electric power stations being constructed in various parts of Russia under the five-years' industrial programme, and also for investigating the properties of porcelain and oil insulating materials.

In the testing rooms there are imitation transmission lines. These are boxes about a yard square containing inductances, &c., which imitate those of transmission lines to be erected. Thus the characteristics of the transmission lines can be studied experimentally in the laboratory before the lines are constructed. This device was first used by Steinmetz in America. The Russian instruments are so arranged that the effect of the transmission lines on neighbouring telephones, &c., can be forecast before the lines are erected.

These notes will give some idea of the close connection between this technical Institute and the electrification of Russia. Students can actually see part of the designing being done by their teachers. There is a noticeable spirit of hope and endeavour in the institution. The building is being thoroughly renovated and extended, and much expensive new equipment is being installed.

I am informed that the Institute could not get money for research before the revolution, but only for teaching purposes. Professors found it almost impossible to do technical research. They could do pure research which cost little, but was divorced from industry. Now they are having their chance. It seems as though able men are feeling that they are having their chance as engineers for the first time. Consequently, they are contented, even if the cost of living is high, and they have to work in two or three institutions because of the shortage of specialists.

Physico-Technical and Polytechnic Institutes.

These two institutes are in Lesnoe, a village about five miles from the centre of Leningrad. It is proposed to turn Lesnoe into a sort of scientific town by extending the institutes and hostels for students. The immense Polytechnic buildings were erected about twenty years ago. It is a teaching institution, and is attended by 8,000 students, mainly in electrical, mechanical, civil, mining, and chemical engineering, but some research is done.

The huge buildings, like most scientific institutions in Leningrad, have recently been renovated and extended. The laboratory equipment is well-kept, and many pieces of expensive apparatus have been added recently. New testing machines for studying the strength of materials are noticeable.

I saw a small first-year class doing practical work in chemistry. The students were diverse in appearance and sex. Some wore military uniforms, some looked about eighteen years old, and others looked like earnest yokels of thirty just up from the country. All were spruce.

The Physico-Technical Institute is independent of the Polytechnic and directed by Professor Joffe. Its chief function is research and the training of professional physicists. Professor Joffe explained to me that ten years ago there were very few physicists in Russia. If a school of physics were to be created, it was necessary to make a sufficiently high concentration of ability in one place. This had been done, and now they had trained about two hundred physicists. The next step was to select from this number physicists who could organise departments in new institutions being founded in the centres of the provinces, Kharkoff for example. Thus they were making a contribution to the extremely important problem of creating centres of culture in the main provinces of Russia.

Many highly interesting researches have been done and are in progress in the laboratories. For instance, a method of using power transmission lines as telephone lines has been developed. In the electrification of Russia, which is being pushed forward under the five-years industrialisation policy, many power lines are being carried over the countryside. It is convenient to be able to use these lines for telephony, without the erection of special telephone wires. A method consisting of a sort of cross between telephone and radio has been devised, and will operate over distances up to three hundred miles along a transmission cable. The Institute has sold this invention to the State, and with the purchase money has bought equipment for a 1,000,000-volt transformer laboratory.

Some interesting work on colloidal solutions is in progress. It has been discovered how to make stable colloidal solutions of the alkalis, sodium and potassium. The method consists of condensing the vapours of the metal and the liquid simultaneously on a cool surface. In this way, the molecules of the two vapours are condensed while intermixed, so very intimate mixtures of the two substances are obtained. Since sodium and potassium easily react with water and air, it is necessary to remove these substances from the apparatus thoroughly. The solutions are stable for months, while those obtained elsewhere, I am informed, are stable for only a few minutes. When these solutions are exposed or thrown into the air, they immediately ignite, since the fine particles of the alkalis immediately react with the oxygen in the air. Perhaps they may prove, alas! to be one more addition to the scientific implements of war. This work has been done by Drs. Tchalnikov and Tomaschewsky.

The method of mixing vapours of metals and other substances and cooling them in order to obtain new kinds of solids is being applied to the study of electric conduction in metals. For instance, a solid mixture of cadmium and anthracene is made up in various proportions. The distance between the atoms of cadmium will be determined by the amount of anthracene present. Since the latter is a non-conductor, the conducting properties of the mixture will depend on the separation and arrangement of the cadmium atoms. By studying the conductivity of various mixtures, it is hoped to obtain information about the size of the electron systems round the cadmium atomic nuclei.

Still another application is made in the preparation of mixtures of aluminium and carbon-dioxide. After the mixture is prepared, it is heated, and the carbon dioxide evaporates, leaving a spongy aluminium. The latter is of interest as a catalyst.

In a research of another type, Dr. Strelkov has devised ingenious apparatus which will preserve a temperature of 1,000 deg. C. steadily within one-tenth of a degree for several days. The arrangement depends on a wire in the furnace. The resistance of the wire varies with the temperature, and causes a galvanometer to throw a spot of light onto a photo-electric cell. The current arising in the cell is amplified and operates a relay. The relay controls the current heating the furnace. So the resistance of the wire in the furnace is made to control the furnace temperature. The arrangement is quite automatic. I understand that Dr. Strelkov prepared single crystals of zinc simultaneously with the German achievement.

One of the strongest departments of the Institution is devoted to X-ray research. Workers in the department feel that their standard of mechanical precision and ingenuity in X-ray work is particularly high.

While studying the nature of the tempering of steel, Dr. Strelnikoff needed very intense sources of X-rays. He obtained these from a rotating water-cooled anti-cathode. It will be remembered that X-rays are usually produced by projecting a stream of electrons against a metal object called an anti-cathode. The shock of the electrons striking the anti-cathode, gives rise, as it were, to the X-rays. Now if the stream of electrons is too strong, it melts the anti-cathode. Dr. Strelnikoff has arranged the anti-cathode so that the part facing the electron stream is changed cyclically. Thus the hot part has an opportunity of cooling down before it again faces the electron stream.

Dr. Maslakover has developed a method of depositing thin layers of metals on paper, silk, glass, &c., by means of anti-cathode scattering. When a stream of electrons strikes the metal of the anti-cathode, particles of the metal are struck off and deposited elsewhere. It is possible to arrange that the particles shall be deposited on silk, for instance. A design in thin metallic gold can be deposited and it will not come off in the wash.

Platinum layers on paper make very useful high resistances. The layers are so thin that they do not overheat. They will stand 3,000 amperes per square millimetre. The layers can be laid spirally on porcelain, if desired.

Some excellent researches on the X-ray analysis of the changes in steel during tempering have been made by Dr. Kurdumov. They are very interesting, but rather too technical to be described here.

Of the applied researches, there are Dr. Davidenkov's ingenious invention for measuring earth pressures. Leningrad is built on swamps, and the foundations of buildings are always tending to sink. In order to measure the changing pressures in the earth due to subsidence, Dr. Davidenkov has constructed a hollow plate like the bellows of an aneroid barometer. When buried in the earth, its sides are pressed towards each other. Inside the plate a fine wire is joined to the centres of the two sides. Its length varies with the pressure on the sides, and hence its time of vibration. It can be caused to resonate with a microphone, so the observer can measure the pressings in the earth by listening to the note of the fine wire. The instrument is usually buried down seven yards. There are thirty-six of them buried in various parts of Leningrad, and the observer has only to ring them up, as it were, to hear how the earth pressures are behaving down there near the foundations of buildings.

I was fortunate in being conducted over the Institute by Dr. Chariton, who recently completed two years' work as a visiting research student in the Cavendish Laboratory at Cambridge.

Research and Electricity Supply.

The director of the E.R.A. indicates how a national co-operative organisation can voice the needs of the user of electrical apparatus.

By E. B. WEDMORE, M.I.E.E., F.Inst.P.

AT the 1929 annual Convention of the Incorporated Municipal Electrical Association the voice of the chairman of the Electricity Commissioners was heard in support of an appeal for a National Organisation for Co-operative Research, the E.R.A. reconstituted on a wider basis both as to management and finance. Thanks to the effective way in which that appeal was followed up by individual members with their own committees and by their colleagues in the supply companies, the authorised undertakings have already agreed to find their minimum share of the funds required for the continuation and expansion of the research programme, and the contributions already to hand have enabled the Research Association to restore to activity several important programmes previously on the waiting list.

The Dilemma of Supply and Demand.

When co-operative research was first started in a small way by the manufacturers before the formation of the E.R.A., it was found that great utility would attach to a body which could speak for the major part of the industry when dealing, for example, with suppliers of materials. It was at that time a common complaint of the supplier that no two manufacturers wanted the same article. As a result something was offered and bought which did not really suit the industry, because the maker required an impossible price for a modified form of his product. When the manufacturers got together it was found possible not only to unify their demand, but also to insist upon a supply. New demands were made and new supplies created greatly to the benefit of all concerned, as wasteful expenditure was saved and inferior products shelved. After the E.R.A. was founded many of the suppliers came into membership as being engaged in allied industries and have found it advantageous to continue close technical co-operation with users of their products. Co-operative researches commenced about the same time by the Institution of Electrical Engineers were again mainly users' researches. Being backed by a body wholly professional, in contrast to one mainly commercial, in outlook, their attack was more detached, more scientific, but it also covered a field not touched by the manufacturers' efforts, namely, researches conducted from the standpoint of the user of electrical appliances, and particularly the chief among such, the authorised undertakers. Such were the researches for the improvement of insulating oils and on the heating of buried cables. This demand on behalf of the authorised undertakings has created an ever expanding supply of better articles and of better technical data governing their use.

Why were not the laws of mutual action of supply and demand effective before, for no doubt existed as to the need of better materials and data? The answer is that the demand was too uncertain, too diffuse. The need required interpretation, voicing.

Needs of the Supply Industry.

The same is true to-day, but the organisation known as the E.R.A. now exists and is actively engaged in voicing the need, by a process as meticulous as the technical process of voicing an organ pipe, without which the organ cannot speak.

The need is being voiced by way of research programmes for better data on the heating of cables buried at considerable depths, the effects of wind pressure on overhead lines, the resistance of the earth to pole foundations of different kinds, the path followed by an alternating current in an earth return and its effect on intercommunication circuits, especially during a fault.

The industry is asking for integrating wattmeters with jewels that require less frequent replacement, hotter hot-plates for electric cooking, better circuit breakers for modern power stations, better protection against the results of voltage disturbances, better protection against fire risks, and these needs are becoming voiced by mutual discussion.

So long as the needs of authorised undertakers are not effectively voiced, the commercial manufacturer can only try him with this and with that, finding what he is willing to buy and experimenting on him with new products. He has no alternative course open to him. By the tardy process of dealing with complaints received he gets to know that improvement in this or that direction is needed, and if a competitor offers a better article he feels the pinch and has to find means of moving forward. Experience has shown, however, how inadequate this process is as a means of supplying the needs of any section of the industry. The writer knows of an instance in which manufacturers were entirely satisfied with a certain line of goods. They were all making them, the consumers were buying them, and there were no complaints, at any rate none effectively voiced. When, however, the manufacturer and user met together at the E.R.A. it was found that this line of goods needed improvement in no less than fifteen particulars. The makers were not to blame. The trouble was that the need had not been effectively voiced.

Language Difficulty and Necessity for Experiment.

It might be thought that public discussion at the I.E.E. or some form of organisation providing for an exchange of opinion would meet the need, but this alone is insufficient, for in the first place the interested parties, though of the same nationality, speak different languages. They attach different meanings to the same words. What are commonplaces of expression to some, convey to others new ideas difficult to comprehend. The first step, and one frequently occupying a year or more of discussion, is to agree upon the meanings of the words which are necessary to express the ideas sought after. The next step is to reconcile the wide divergences of opinion which emerge from discussion. These divergences arise not only because of differences of viewpoint, but for lack of experimental evidence. Both designers and users have developed to a high degree of perfection the art of arriving at useful conclusions on inadequate data. They have had to. The cost of obtaining adequate data has been beyond the capacity of the purses they can dip into individually. But with the pooling of resources, through a co-operative organisation, the means are forthcoming and critical experiments can be planned and executed which determine once for all the facts in question and lay a sure foundation for further progress.

An example may be given. Some years ago a British standard specification was issued for enamelled wire. Its adoption represented an advance at the time, but the specification shortly fell into disuse. Different buyers began to make different demands of the maker and large makers did big business in goods which were not of the British standard. At the time the specification was put in hand there was no organisation for co-operative research available. The clauses were based on a successful compromise of opinions and experience, but for lack of experimental facilities were somewhat inadequate for

securing what was required. Since that time the B.E.S.A. has referred the difficulties to the E.R.A. for examination. This examination has necessitated two years of experiment and discussion, experiment alternating with discussion, and the result in the immediate future will be a specification based on ascertained fact and methods of test adequate to the needs of all the parties interested and well proven. The ultimate user will get a more reliable article in the apparatus he buys, something he could not previously demand.

It is no longer sufficient that a municipal engineer, or one in the employ of a power company, should have inborn genius, be well versed and skilled in his art, and be of ripe judgment. He must have the means in this age of rapid progress of effectively voicing his needs, and surely no better means exists than those of mutual discussion and experiment arranged between buyer and seller in an atmosphere such as the E.R.A. provides, where there are no contracts pending, and where under the skilful guidance of experienced chairmen the buyers and sellers open their hearts and progress together towards the solution of what are in fact their common problems.

Yet there are still some who think " this is the manufacturers' business " and stand outside.

Progress in the Cable Industry.

Research Keeps Pace with Recent Developments in Practice.

By C. J. BEAVER, M.I.E.E.

(*Concluded from page* 1008.)

From the point of view of cable-manufacturing practice, the result of the observations of the user has been to stimulate the maker to greater efficiency in the provision of chemical protection of cable sheaths, and a marked technical advance has been made. In part, this has been rendered possible by the availability of petroleum pitches and natural bitumens, the physical properties of which are markedly superior to those of the coal-tar distillation products which were formerly used.

It is an elementary principle with regard to coatings of metal surfaces and fillings of yarn and fabric wrappings that they should be homogeneous, and tough and tenacious over a wide range of temperature; herein the petroleum products score heavily over the coal tar products. These properties have very considerable influence on weather-resisting properties, particularly where exposure to moisture and changing temperature is encountered. There is a certain glib tendency to describe and specify layers of yarns or fabric tapes and coatings of compound as " waterproof " protection, albeit no fibrous material can be made " waterproof " except by virtue of complete enclosure in a continuous film or envelope of non-fibrous material, such as compound, which it is practically impossible to ensure. Recent practice, however, tends to make the best of it by utilising flat tapes of previously impregnated paper or woven material to imprison layers of compound in thick films without sinking through them as single yarns tend to do. The paper layers are placed next to the compounded lead, and, having no mechanical value, simply function as compound-film enclosing layers; the outer fabric layers, being usually openly woven, also function as film enclosing layers, but they also key into the underlying compound, and are embedded by a succeeding layer of compound. The ideal conception is, of course, to apply a heavy layer of compound, and to reinforce it uniformly with a flexible fabric into which the compound above and beneath keys itself thoroughly by reason of its being applied in a molten state. This keying is facilitated by the similar compound carried by the yarns of the fabric as the result of preliminary treatment by drying and impregnating in vacuo. In special cases when it is imperative to secure definite insulation of the lead, *e.g.*, for the purpose of resisting electrolytic attack, or insulating against sheath voltages, a non-fibrous sheath of vulcanised bitumen or compound rubber is applied over the lead covering.

The availability of an improved degree of chemical protection has recently led to the use of unarmoured cables laid direct in the ground, a " warning board " or layer of tiles or concrete slabs being relied upon as sufficient precaution against accidental damage. This method has been largely used by the Central Electricity Board for super-tension cables, three single-core cables being strapped together and laid direct in a trench. This departure in laying practice has been strongly criticised in some quarters as lacking the mechanical protection of the armoured laid direct system and the chemical protection of the solid system, but, as both these systems have limitations to their ostensible lines of defence, it remains to be seen from experience whether the net result in both directions is satisfactory. The pros and cons are not here under discussion, the present object being to note that an improvement in manufacture has rendered possible an economical modification in British laying practice.

Immersion Tests.

A matter which is closely related to compounding over lead is a certain readjustment of views which is taking place regarding the testing of lead-covered cables in water. Lead undergoes a certain amount of oxidation when exposed to air, and in the presence of moisture the oxide may readily become carbonated. Adhesion of the compound is obviously best ensured by applying it to the lead sheath as it emerges from the press in a dry, hot, unoxidised condition. This practice is becoming general, and is sometimes specified by consultants; but it renders the water test comparatively futile, because small defects in the lead become sealed up by the compound. In conjunction with this, we have the fact that the ordinary immersion test is already out of effective range in the case of heavily insulated cable, owing to the resistance to radial penetration of the water. The writer has applied the normal electrical tests daily for periods of several weeks to 33-kV single-core cable entirely stripped of lead, continuously immersed in water without any indication of weakening.[4]

The general perspective of this matter has, of course, long been appreciated, as witnessed by the introduction

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So far, this survey has been mainly concerned with paper-insulated cables, although, obviously, remarks regarding protective coverings are applicable to all types. In the compass of such an article as this, many things worthy of note cannot find place, but it would lose any claim to adequacy without reference to the considerable advances that have been made in the use of other dielectric materials, such as rubber and varnished cambric.

The developments in vulcanised rubber cables furnish a good example of the bearing thereon of the two main influences referred to at the beginning of this article. Taking that referred to as the more rigorous demands occasioned by extensions in the use of electricity, one notable instance is that of portable cables. The development of electric cranes, coal cutters, dredgers, shovels, lifting magnets, portable tools, &c., has entailed cable conditions which only careful design and improved technique can fulfil. The requirements have combined electrical, mechanical, and chemical problems of no trivial order; and it would have been a bold prophecy a decade ago that, for example, satisfactory operation of long lengths of 6,600-volt portable cables, connecting dredgers to land lines, would by now be an everyday matter.

The other main influence—extension of research facilities—has produced a very marked advance in the technology of rubber, of which advantage has been taken to attain improved physical and chemical properties in rubber dielectrics.

The use of accelerators and anti-oxidants has been considerably extended, with the broad result that the durability of rubber dielectrics has been definitely brought on to a higher plane. While the method of functioning of the latter class of bodies is somewhat obscure, it is well known and readily demonstrable that the improved results due to the former are attained by reason of the close limitation and control of the vulcanisation reactions which they afford. Increased knowledge of the physics of compounding ingredients has also contributed to a valuable extent towards the same general end, and has assisted appreciably in the fulfilment of many exacting requirements.

In consonance with these advances, means and methods of verification have been the subject of a good deal of scientific investigation. Ageing tests have been made to approach a reasonably true indication of durability in terms of years; mechanical tests have been designed to indicate expectations of life under working exigencies; and combinations of chemical, physical, and mechanical tests have been developed to a correspondingly useful state.

The advent of compound rubber insulation has tended to supplant vulcanised bitumen cables, although they still have some vogue in colliery work. For mains work they have been almost entirely ousted, and, so far as reasons for this supersession turn on the absence of metal sheaths, rightly so. Further, they have to some extent been under an undeserved stigma in connection with "bitumen gas" explosions. The part played by the vulcanised bitumen dielectric in such occurrences is really very small; the chief source of the gas generated at faults is the trough filling compound, accentuated in most cases by coal gas, with which the soil in town streets is usually permeated.

Compounds used for trough filling have a great affinity for coal gas, which practically acts as a solvent, producing a superficial softening or liquefying action on it. The dielectric material is comparable with rubber in so far as the products of its volatilisation are inflammable, but this is a very different thing from the explosive mixtures which can easily be formed by the fractional distillation of the trough filling compound and its absorbed coal gas by the heat generated by the fault.

Varnished cambric cables, although not standardised in this country, are finding more and more extensive uses. Their position in the range of types of cable available for various conditions of use is somewhat anomalous, inasmuch as they are chiefly desirable in cases where lead sheaths are inconvenient; while, on the other hand, they are not suitable for indiscriminate exposure to moisture without definitely waterproof sheaths. Improvements in manufacture are tending to afford a compromise, and in many cases manufacturers of outdoor switchgear, &c., have taken the risk of using the non-sheathed type under conditions of full exposure to weather. A further compromise, which practically goes the whole way in this direction, but which has not yet found extensive appreciation by users, is the embodiment of a continuous thin non-metallic sheath under the exterior braiding. This limits the penetration of moisture, and the effects of alternate wetting and drying, to the outer covering. Under interior conditions of installation where moisture r[illegible]ks are represented by ordinary atmospheric variati[illegible], there is usually no necessity for a waterproof shea[illegible].

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The New Zealand Electrical Market.

Competition in various branches of the trade is dealt with. The progress of electricity indicates a continued demand for appliances.

AMID the welter of gloomy reports from the four quarters of the globe a recent survey of conditions in New Zealand by Mr. W. D. Lambie, of the Trade Commissioner's Office, Wellington,* comes as a welcome relief. The Dominion continues to prosper, the foundation of this prosperity being its primary industries, and it remains the most sympathetic market in the world for British manufactured products. Mr. Lambie says that if British goods of a type which appeals to the judgment and at a price only reasonably competitive are offered, they will almost certainly be preferred to goods of other origin. In 1928 exports reached a record figure and the total for 1929 will fall but little short. Import trade responded slowly to the favourable influences in 1928 but speeded up somewhat last year. It would appear that the United Kingdom is losing ground in the New Zealand trade over a fairly wide range of goods. The United States and Canada have gained by this, but France and Germany, two of Great Britain's principal competitors, appear to be falling away somewhat.

The success of the North American countries is attributed to effective salesmanship in a number of directions. It is, however, reassuring to learn that many British firms are now paying closer attention to the requirements of the market, are improving their standards of packing and labelling, and are sending responsible representatives to study conditions on the spot. Mr. Lambie maintains that there is still much remaining to be done, especially as regards giving the New Zealander what he wants and not what the supplier thinks he ought to have.

The Electrical Import Trade.

One of the most interesting and valuable features of the report is an appendix in which the trend of trade in some of the principal imports (about 160 classes) is analysed. Electrical goods are adequately dealt with. During the first nine months of 1929 the value of imported electrical machinery and equipment was £1,487,461, as compared with £1,577,420 in the coresponding period of 1928. The United Kingdom (£787,327) was the principal supplier, next in order being the United States (£368,788), Canada (£130,577), the Netherlands (£36,523), Australia (£35,588), Germany (£33,858) and Sweden (£22,861. It is shown that imports of generators, motors and transformers consistently declined from 1926 to 1928, but the United Kingdom and the United States increased their shares at the expense of Sweden, Germany, Canada, and Switzerland. During the first nine months of last year the United Kingdom's share declined while that of the United States increased. Insulated wire and cable imports have fallen off considerably in the last three or four years; the United Kingdom is responsible for all but a small part of this trade (£345,666 out of a total of £374,747 in 1928). The report says that in some instances Continental manufacturers appear to have been quoting abnormally low prices, suggestive of dumping, presumably with the aim of securing a footing in the market. A steady decrease has also occurred in copper wire imports in which the United Kingdom has gradually assumed a commanding position; this country supplied 97 per cent. of the imports in 1928.

The imports of incandescent electric lamps rose sharply in 1928 and the United Kingdom and the Netherlands gained ground at the expense of the United States. Imports of other electric lamps showed a decrease which largely fell upon the United States, the principal supplier. Telegraph and telephone apparatus imports decreased in 1928. A sudden rise in the share of Belgium put that country at the head of the list of suppliers, displacing the United States. The United Kingdom suffered a setback but recovered ground in the first nine months of last year, as did the United States which again assumed the lead. The bulk of the demand for radio sets was met by the United States, this country providing but a small proportion of the imports.

Imports of electrical batteries and cells have shown a rising tendency in recent years. The principal supplier is the United States but the United Kingdom gained ground in 1928 in spite of the handicap imposed by distance. A set-back occurred last year, however. There was a decrease in the number, but a rise in the value, of electricity meters imported during 1928. Although the United Kingdom again secured the bulk of the trade its share was lower, but that of Canada made a considerable jump in value. This rise continued in the first nine months of 1929. Canada was the leading supplier of vacuum cleaners in 1928, the United Kingdom being far behind the Dominion, Sweden, and the United States. The market has been intensively cultivated by door-to-door canvassing and other methods. There was a substantial fall in the imports of washing machines in 1928 but the United Kingdom's proportion of the trade increased at the expense of the United States.

* Published by the Stationery Office (for the Department of Overseas Trade), 2s. 6d. net.

Competitors in the Market.

The report summarises the import trade position as it concerns the leading suppliers to the market. The principal competitor of the United Kingdom in New Zealand is the United States. The struggle between them is a keen one and each has made its gains and losses in many items of trade. While this country has gained ground from its chief rival in the case of copper wire, ground has been lost in generators, electric batteries, &c. Belgium has progressed in the trade in telephone apparatus at the expense of the United States. Among Canada's principal contributions to the trade are electrical machinery and apparatus, and the Dominion has lately gained ground from the United Kingdom in electric batteries and electricity meters. Germany's quota has slowly risen in the last few years, but it is still only of the order of 2 per cent. In the case of electrical machinery and equipment Germany's share rose from £29,000 in 1926 to £62,000 in 1927, but fell in the next year to £38,000. Belgium is an increasing factor in New Zealand's import trade and has taken part of the British trade in telephone apparatus. Switzerland and Sweden are suppliers of electrical machinery, but the latter has recently been losing ground. Holland, also, has lately provided a smaller proportion of the electric lamp imports.

Hydro-electric Development.

Of a total expenditure of £8,331,884 by the Public Works Department during the year ended March 31st, 1929, £1,183,103, or 14.2 per cent., was devoted to hydro-electric development. The total capital invested in hydro-electric works as at March 31st, 1929, was £8,467,735, but expenditure is now decreasing annually. The work which has been carried out has made electricity available to well over 90 per cent. of the population and demand has followed closely upon the heels of supply. The enormous growth of the supply industry is evidenced by the fact that the total capital expenditure by the Government and local authorities increased from £1,600,000 in 1916 to £23,800,000 in 1929, and in addition some £2,000,000 had been expended on works which at the end of the financial year had not been brought into operation. From 1920 to 1929 the *per capita* consumption in New Zealand rose from 148 to 398 kWh per annum. It is thought that during the next few years the greatest increase in load will be from the demand for various domestic uses. The report gives some details of the work carried out on the Government's four major hydro-electric schemes. In the South Island, it is said, the preliminary work is well in hand for the erection of a dam on the Waitaki to provide for the development of 30,000 h.p. The scheme, together with the necessary transmission lines, is estimated to cost £1,200,000.

A private syndicate has been authorised to develop 50,000 h.p. in the vicinity of Deep Cove, Doubtful Inlet, and a further 250,000 h.p. from Lake Manapouri. Negotiations are proceeding with the object of raising the necessary capital in London for the erection of the works. It is proposed to utilise the power for the manufacture of nitrates from the air, while other electro-chemical and electro-metallurgical industries are contemplated.

The Telephone System.

Satisfactory results have been secured by the Post and Telegraph Department for some years. As elsewhere the telephone is rapidly superseding the telegraph as a means of speedy communication. The carrier-current system of telephony has been introduced by the Department. Progress is being made with the "automatisation" of the telephones; at March 31st, 1929, 42 per cent. of the telephones in use were automatic, and since then further conversions have been made. Mention is made of the installation of three all-British automatic exchanges, and the keen Continental competition is again stressed. British radio manufacturers do not appear to have been very successful in the Dominion although the trade has grown considerably in the last two or three years.

United States Electrical Exports.

Figures for 1928 and 1929 Compared.

BELOW are shown the values of electrical machinery and apparatus exported from the United States during the 12 months ended December last. Comparative figures for the year 1928 are added, and notes of increases of decreases are also given.

	1928. Thous. $	1929. Thous. $	Inc. or dec. Thous. $
Electrical machinery and apparatus (total)	90,780	121,360	+30,580
Generators—			
Direct current—			
Under 500 kW	1,231	1,290	+ 59
500 kW and over	624	860	+ 236
Alternating current—			
Under 2,000 kVA	227	295	+ 68
2,000 kVA and over	394	310	− 84
Steam turbine generator sets	856	1,020	+ 164
Accessories and parts for generators	1,094	980	− 114
Self-contained lighting outfits	1,116	1,190	+ 74
Batteries—			
Flashlight batteries	2,940	3,460	+ 520
Other primary batteries	2,750	2,740	− 10
Storage batteries	3,400	3,470	+ 70
Transforming or converting apparatus—			
Power transformers, 500 kVA and over	1,200	1,350	+ 150
Distribution transformers, less than 500 kVA	830	1,300	+ 470
Instrument transformers	90	155	+ 65
Battery chargers, under 15 amps.	289	235	− 54
Other transformers	893	1,450	+ 557
Rectifiers, double-current, and motor generators, dynamotors, synchronous, and other convertors	1,130	1,280	+ 150
Transmission and distribution apparatus—			
Switchboard panels, except telephone	1,620	1,180	− 440
Switches and circuit breakers over 10 A	1,760	2,300	+ 540
Fuses and fuse blocks	440	570	+ 130
Watt-hour and other measuring meters	990	1,270	+ 280
Indicating instruments	450	700	+ 250
Recording instruments	220	325	+ 105
Other testing apparatus	870	1,050	+ 180
Lightning arrestors, choke coils, reactors and other protective devices	780	995	+ 215
Motor starters and controllers—			
Motors, ¼ h.p. and under	2,120	2,700	+ 580
Motors over ¼ and under 1 h.p.	840	780	− 60
Stationary motors			
1 to 200 h.p.	2,870	4,250	+ 1,380
Over 200 h.p.	390	400	+ 10
Railway motors	600	300	− 300
Electric locomotives—			
Railway	1,060	660	− 400
Mining and industrial	470	470	—
Station and warehouse electric motor trucks	180	190	+ 10
Starting and controlling equipment—			
For industrial motors	1,520	1,990	+ 470
For electric railway and vehicle motors	240	205	− 35
Portable electric tools	1,300	1,360	+ 60
Accessories and parts for motors	2,542	3,490	+ 948
Radio apparatus—			
Transmitting sets and parts	770	1,940	+ 1,170
Receiving sets	4,550	9,780	+ 5,230
Tubes	1,020	2,000	+ 980
Receiving set components	3,050	4,420	+ 1,370
Receiving set accessories	2,670	4,930	+ 2,370
Telephone apparatus—			
Telephone instruments	435	980	+ 545
Telephone switchboards	400	1,626	+ 1,226
Other telephone equipment	2,490	3,960	+ 1,470
Railway signals, switches, and attachments	710	1,240	+ 530
Bells, buzzers, annunciators and alarms	360	400	+ 40
Telegraph apparatus	860	1,070	+ 210
Other electrical apparatus—			
Spark plugs	1,420	2,100	+ 680
Other starting, lighting, and ignition apparatus	1,080	1,850	+ 770
Insulating material	1,350	1,490	+ 140
Metal conduit, outlet, and switch boxes	1,330	1,550	+ 220
Sockets, receptacles and lighting switches	1,930	2,130	+ 200
Electric interior lighting fixtures	2,090	2,620	+ 530
Electric street lighting fixtures	570	630	+ 60
Other wiring supplies and line material	1,070	1,450	+ 380
Other electrical apparatus	8,300	13,470	+ 5,170
Electrical appliances—			
Electric fans	940	1,190	+ 250
Electric lamps—			
Metal filament	1,460	1,310	− 150
Other electric lamps	600	635	+ 35
Flashlights	2,530	2,590	+ 60
Searchlights and projectors	640	570	− 70
Household washing machines	1,820	2,000	+ 180
Vacuum cleaners	1,310	1,490	+ 180
Flat irons	360	380	+ 20
Cooking ranges	300	350	+ 50
Other domestic heating and cooking devices	930	1,010	+ 80
Industrial electric furnaces and ovens	454	480	+ 26
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries, &c.	1,780	1,950	+ 170
The following, not included in the total of electrical apparatus, were also exported :			
Insulated iron or steel wire and cable	220	390	+ 170
Insulated copper wire and cable	4,820	6,180	+ 1,360

Canadian Tariff Amendments.

Increased Preference to British Suppliers.

WE have received from the Canadian Department of National Revenue a schedule of the alterations in the Dominions Customs tariff effected by the 1930-31 Budget resolutions. From this we have compiled the following table showing amendments relating to certain classes of electrical machinery and apparatus. The general effect of the alterations is to increase the preference given to British products.

Tariff Item	Description	British Preferential Tariff	Intermediate Tariff	General Tariff
315a	Carbon electrodes exceeding 35 in. in circumference	Free	20 p.c.	20 p.c.
409o	Equipment for generating electric power for farm purposes only and complete parts	Free	10 p.c.	10 p.c.
	Coal-cutting machines, electric or magnetic machines for concentrating or separating iron ores, &c.	Free	Free	Free
415	Electric vacuum cleaners, &c., and complete parts	12½ p.c.	20 p.c.	25 p.c.
415a	Refrigerators, domestic or store	12½ p.c.	20 p.c.	25 p.c.
415b	Washing machines	Free	15 p.c.	25 p.c.
423	Electric dental engines	Free	15 p.c.	20 p.c.
443	Electrical apparatus designed for cooking or for heating buildings	Free	22½ p.c.	25 p.c.
443a	Electric tumbler and rotary switches and electric relay switches for automatic oven control, when imported by manufacturers of electrical apparatus designed for cooking or for heating buildings, for use exclusively in the manufacture of apparatus in their own factories, under regulations prescribed by the Minister	7½ p.c.	20 p.c.	25 p.c.

Tariff Item	Description	British Preferential Tariff	Intermediate Tariff	General Tariff
443b	Parts, when imported by manufacturers of electric switches for use exclusively in the manufacture of electric tumbler and rotary switches and electric relay switches for automatic oven control, for use on electrical apparatus designed for cooking or for heating buildings	Free	12½ p.c.	17½ p.c.
444b	Lamp shades, n.o.p., and shade-holders	15 p.c.	27½ p.c.	30 p.c.
445	Electric light fixtures and appliances, n.o.p., and complete parts	15 p.c.	27½ p.c.	30 p.c.
445a	Electric head, side and tail lights; electric torches or flashlights	15 p.c.	27½ p.c.	30 p.c.
445b	Electric arc and incandescent lamps	15 p.c.	27½ p.c.	30 p.c.
445c	Electric telegraph or telephone apparatus and complete parts	15 p.c.	25 p.c.	27½ p.c.
445d	Radio apparatus and complete parts	15 p.c.	25 p.c.	27½ p.c.
445e	Electric and galvanic batteries, n.o.p., and complete parts	15 p.c.	25 p.c.	27½ p.c.
445f	Electric dynamos or generators and transformers, n.o.p., and complete parts	15 p.c.	25 p.c.	27½ p.c.
445g	Electric motors, n.o.p., and complete parts	15 p.c.	25 p.c.	27½ p.c.
445h	Electric insulators of all kinds, n.o.p., and complete parts	15 p.c.	25 p.c.	27½ p.c.
445i	Electric irons and complete parts	15 p.c.	25 p.c.	27½ p.c.
445j	Electrical apparatus, of a class or kind not made in Canada, n.o.p., and complete parts	Free	15 p.c.	20 p.c.
445k	Electrical apparatus, n.o.p., and complete parts	15 p.c.	25 p.c.	30 p.c.

The former British preferential duties on the above classes of goods were as follows:—Item 315a, 12½ per cent.; item 4090, 5 per cent.; items 415 and 415a, 20 per cent.; items 415b, 423, 443, 443a, and 443b, 15 per cent.; items 444b, 445, 445a and 445b, 20 per cent.; and items 445c to 445k inclusive, 15 per cent.

Note: "n.o.p." means "not otherwise provided for."

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

British Locomotive Engineers in Switzerland.

Over a hundred members of the Institution of Locomotive Engineers are in Switzerland for the summer meeting of the Institution. In addition to the official conferences arrangements have been made for visits of inspection of the latest electrical developments on the Swiss Federal Railways. The programme includes a visit to the Oerlikon factory, where what is claimed to be the largest electric locomotive in Europe will be on view. This is equipped with sixteen motors, developing a total of 7,200 h.p.; the locomotive has been especially designed for the steep gradients of the St. Gothard route. Visits to the repair shops of the Swiss Federal Railways at Bellinzona and to the Brown-Boveri factories are two other important items in the itinerary.

Tasmania and the Australian Tariff.

A Hobart correspondent of the *Times Trade and Engineering Supplement* says that considerable apprehension is felt in Tasmanian commercial circles regarding the effect of the Commonwealth Government's tariff policy. It is emphasised that it would have been a sounder policy to enter into closer trade co-operation with Great Britain and to prohibit, if prohibition were decided upon, the flood of luxuries coming from America. The prohibition of imports of electric cooking and heating appliances is viewed with dismay by the sections of the trade interested, and it is pointed out that the Tasmanian Government's Hydro-Electric Department is equally concerned, as any increase in cost will inevitably hinder development.

Holophane Contracts.

Among the contracts recently secured by Holophane, Ltd., is one for the street lighting at Sao Paulo. This will include the installation of about 16,000 street lighting units. Other important installations carried out by the company in South America include those for Buenos Aires (30,000 lighting units), and Santiago, Chile (11,000 units).

Great Britain's Radio Exports.

Figures published by the *Wireless and Gramophone Trader* show that in March last radio goods valued at £76,857 were exported from this country, making the total for the first quarter of the year £292,492, against £301,867 in the corresponding period of 1929. The March exports included valves valued at £24,629. Our principal customer was Holland, with a share of £9,654, of which valves accounted for £336. Australia was second with £8,558 (valves £4,591), and France third with £8,570 (valves £7,009). Re-exports had a value of £18,706 (valves £1,057), of which Holland took £12,016 (valves £877).

Wages in the Electrical Contracting Industry.

The National Federated Electrical Association announces that the fall in the cost-of-living index justifies a reduction of wages in the electrical contracting industry. The new rates will come into effect on the second pay-day in June for the period covered by that pay-day and they will remain in force for Grades B, C and D up to and including the period covered by the first pay-day in October. The rates are as follows:—Grade A, 1s. 10d. per hour; Grade B, 1s. 7d.; Grade C, 1s. 5½d.; and Grade D, 1s. 4d. The Grade A rate includes the increase of 5 per cent. on current rates which was conceded last year and represents a reduction of 1d. per hour. The reduction in the case of the other grades is ¾d. per hour.

Spanish Customs Regulations.

The *Board of Trade Journal* states that the Spanish Government has withdrawn, in the case of many items of the Customs tariff, the requirement that imported goods should be accompanied by a certificate of origin. Among the classes affected are electrical machinery and apparatus (except telegraph and telephone apparatus, incandescent lamps and radio valves).

Recent Contract.

The West Midlands Joint Electricity Authority has awarded the contract for the coal-handling plant for the new Ironbridge power station to the Mitchell Conveyor & Transporter Co., Ltd. The plant consists generally of "Mitchell" patent side-discharge weighing-type tipplers for unloading colliery wagons up to 20 tons capacity, and a series of ball-bearing type belt conveyors for placing the coal into the boiler house bunkers or into store. Another interesting feature is a travelling store bridge spanning the coal store, fitted with two special type elevators for reclaiming coal from store.

Unemployment.

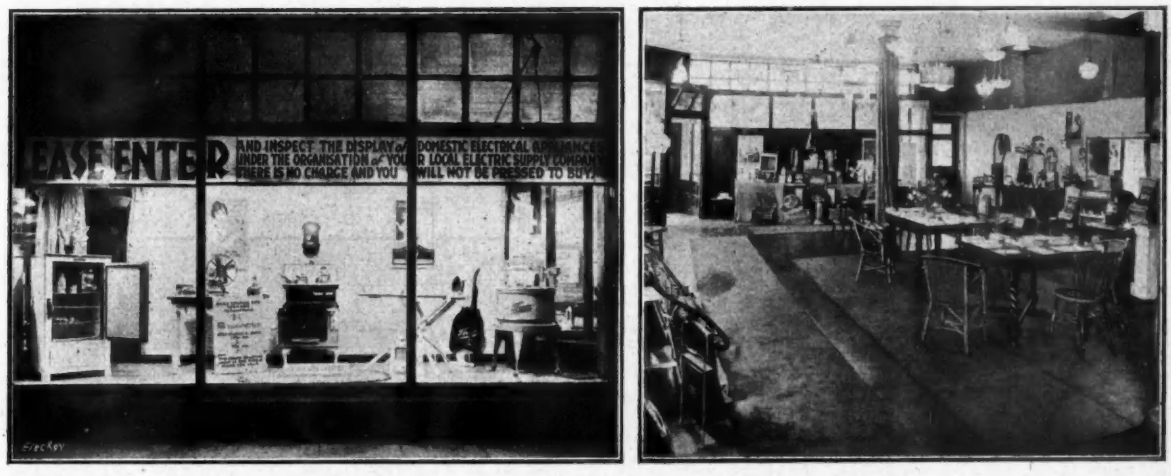
There was an increase of 20,015 in the number of registered unemployed during the week ended May 19th, at which date the total was 1,759,500, as compared with 1,739,485 on May 12th. No figures are available for May 20th, 1929, owing to the incidence of Whitsun Bank Holiday.

Lighting Fittings Prices Reduced.

On April 15th, 1929, members of the Electric Light Fittings Association advanced their prices by 5 per cent. owing to the rise in the costs of copper and other raw materials. We are informed that this advance has now been withdrawn in consequence of the fall in the prices of raw materials.

Local Exhibition.

An electrical exhibition was opened at the beginning of May by the London Electric Supply Corporation, Ltd.—its first venture—at 201, Lewisham High Road, S.E. In organising this exhibition the company invited two local electrical contractors and various manufacturers to co-operate, and the result was an attractively arranged display of domestic appliances ranging from the smaller apparatus, such as electric irons, to washers, cookers, water heaters and fires. One result of the exhibition was a demand for the more expensive types of electrical apparatus, the number of orders for these appliances being exceptionally high. Before the exhibition opened, and during its run, the company took adequate steps to attract the attention of residents in the area, and in addition to advertising in the local Press, sent out invitations to all its consumers. The possibilities of the future were not lost sight of, and parties of school girls were invited to lectures and demonstrations on electric cooking and washing. Essays which they have written show that the seed has not fallen on barren ground. The company has an "all-in" domestic tariff, the standing charge of which has recently been reduced by 25 per cent. to 15s. per annum per living room, the "unit" charge being 1d. In addition it lets out on hire, cookers, fires, water heaters, &c., at a modest quarterly charge. The manufacturers represented were the General Electric Co., Ltd.; Jackson Electric Stove Co., Ltd.; Belling & Co.; Sadia, Ltd.; Edison Swan Electric Co., Ltd.; British Thomson-Houston Co., Ltd.; and the British Vacuum Cleaner and Engineering Co., Ltd., while the local contractors were Messrs. Haycraft & Sons, who wired the exhibition for heating and cooking, and Messrs. W. M. Williamson, who were responsible for the lighting circuits and fittings. When the exhibition was first opened it was intended to close it on May 16th, but the attendances and business done exceeded expectations, and the period was extended till May 30th.


EASE ENTER
AND INSPECT THE DISPLAY OF DOMESTIC ELECTRICAL APPLIANCES
UNDER THE ORGANISATION OF YOUR LOCAL ELECTRIC SUPPLY COMPANY
THERE IS NO CHARGE AND YOU WILL NOT BE PRESSED TO BUY.

Exterior and Interior Views of the "Lesco" Exhibition.

New French Companies.

Under the auspices of a number of French engineering and electrical concerns as well as several banks, a new concern has recently been organised in Paris, with the title La Société d'Etude et de Construction de Centrales Electriques, E.C.C.E., to finance and construct electricity supply stations in foreign countries. The new undertaking has already secured a contract to construct a hydro-electric power station at Kritchim, Bulgaria, which will supply electricity to the towns of Philippopolis and Bazarjie and the valley of Maritza.

Among other companies recently formed in France are the Compagnie pour les Industries de l'Electricité et de la Mécanique, Région Lyonnaise et du Sud-Est, Lyons; the Société des Forces Motrices du Jura et des Alpes (Juralpes), Paris, capital £1,200,000: and La Société de Forces Motrices des Pyrenées Centrales, Paris, capital £120,000.

South African Automatic Telephone Contracts.

In reply to questions in the House of Assembly, the Union Minister of Posts and Telegraphs stated recently that orders had been placed for the installation of automatic telephones in Johannesburg and Cape Town with Messrs. Siemens Bros. and Co., Ltd., and the Automatic Telephone Manufacturing Co., Ltd. The cost of the total conversion covered by the contracts would be approximately £750,000 over a period of five years.

Wages in the Cable Making Industry.

The Joint Industrial Council for the Electrical Cable Making Industry informs us that there will be no "cost-of-living" alteration in wages on the third pay-day in June.

New Municipal Showrooms.

The Weymouth Electricity Committee has decided to appoint an architect to prepare a scheme for the erection of electrical showrooms on a site in Royal Terrace, Weymouth.

Manufacturing in Australia.

The Canberra correspondent of *The Times* reports that on May 30th, in the House of Representatives, Mr. Forde, Acting Minister of Customs, stated that overseas manufacturers who were intending to begin production within Australia in consequence of the new tariff included Philips Lamps (for the manufacture of radio receivers and parts) and the Bosch Aktien-Gesellschaft. In addition the Australian General Electric Co. was taking up the manufacture of electric lamps.

New Catalogues and Lists.

Messrs. L. G. HAWKINS & Co., LTD., 30-35, Drury Lane, W.C.2.—Two illustrated folders dealing, respectively, with the "Universal" electric range and the "Caffield" electric ironer.

Messrs. DAVID BROWN & SON (HUDDERSFIELD), LTD., Huddersfield.—Technical data sheet No. 1330 describing standard helical double-induction gear, roller-bearing type.

POPE'S ELECTRIC LAMP CO., LTD., 5, Arthur Street, New Oxford Street, W.C.2.—A price list of "Elasta" lamps.

IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, E.C.4.—Print No. 1040 illustrating self-acting starters and master switches for polyphase squirrel-cage motors.

BAXTER & CAUNTER, LTD., 219, Tottenham Court Road, W.1.—June price list (No. 55) of electrical accessories. Illustrated.

Messrs. LESLIE DIXON & Co., 218, Upper Thames Street, E.C.4.—An illustrated and priced list of laboratory apparatus for disposal.

Messrs. JAMES TATE & Co., Victory Works, Bradford.—A booklet giving particulars and illustrations of the Tate electrical control unit for the operation of valves.

HOLOPHANE, LTD., Elverton Street, Vincent Square, S.W.1.—A well-produced brochure (Catalogue No. 160) giving particulars, dimensions and illustrations of "Holophane" street reflectors, steel tube lamp standards, extension brackets, and pole brackets.

Messrs. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD.—An illustrated leaflet drawing attention to the company's sheet steel pillars.

Messrs. S. G. BROWN, LTD., North Acton, W.3.—The "Brown Budget" for May contains a number of interesting articles on the company's activities both at home and abroad.

MIDLAND ELECTRIC MANUFACTURING CO., LTD., Barford Street, Birmingham.—A booklet containing illustrated particulars of the "Memota" starting switches for motors up to about 10 h.p.

METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.—Leaflet No. 458/1-1, containing illustrated particulars of the company's latest type of worm-geared electric winches for high-speed handling.

Messrs. Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.—A pamphlet and illustration of the new Callender service box which the company has recently produced.

Bankruptcy Proceedings.

L. E. Hember, electrical engineer, 4, Pepper Street, Lymm, Ches.—The receiving order herein was made on the debtor's own petition recently, and according to his statement of affairs there are liabilities amounting to £994 against assets of £301, leaving a deficiency of £693. The debtor's failure is attributed to lack of capital, keen competition, and to the drawings from the business. The following are creditors:—

	£		£
Baxendale & Co., Ltd. ...	120	Henley's, W. T., Telegraph Works Co., Ltd.	95
Beardsall, W. E., & Co.	163	Hart Accumulator Co., Ltd.	24
Falk, Stadelmann & Co., Ltd.	84	Philips Lamps, Ltd. ...	33
General Electric Co., Ltd.	111	Sloan Electric Co., Ltd.	46

D. W. Morphy, manufacturer of radio apparatus, lately of 4-5, Dorset Mews North, Upper Gloucester Place, W.—An application was made to Mr. Registrar Mellor at the London Bankruptcy Court on May 23rd for an order of discharge on behalf of this bankrupt who failed last January with provable debts of £3,799 and assets which have realised £344. The application was opposed by the Official Receiver on three statutory grounds and the discharge was suspended for six months.

H. A. Atack, electrician and wireless accessories dealer, 442, Borough Road, Birkenhead.—Receiving order made May 26th on debtor's petition. First meeting June 6th, at the Official Receiver's office, Government Buildings, Victoria Street, Liverpool. Public examination, July 2nd, at the Court House, Pilgrim Street, Birkenhead.

T. H. Dennis, electrician, &c., 176, 178 and 195, Denman Street, Nottingham.—Receiving order made May 26th on debtor's petition. First meeting June 6th, at the Official Receiver's Office, 22, Regent Street, Park Row, Nottingham. Public examination, July 3rd, at the County Court House, St. Peter's Gate, Nottingham.

T. S. Hanson, electrical contractor, 26, Nether Hall Road, Doncaster.—Receiving order made May 26th on debtor's petition.

N. G. Edgehill, electrical and wireless engineer, 13, Wembley Hill Road, Wembley.—Application for discharge to be heard on June 24th, at the Court House, St. Albans.

C. Austin, musical instrument and wireless accessories dealer, 97, Domestic Street, Leeds.—First and final dividend of 3s. 6d. in the £, payable June 20th at the Official Receiver's office, 24, Bond Street, Leeds.

D. Brayshaw, electrician, 78, Granby Street, Liverpool.—Trustee, Mr. J. Allcorn, Official Receiver, Government Buildings, Victoria Street, Liverpool, released May 2nd.

Company Liquidations.

Electrical Supplies (Liverpool) Ltd.—A meeting of members is called for June 27th at the offices of the liquidators, 35, Exchange Chambers, 2, Bixteth Street, Liverpool, to hear an account of the winding up from the liquidators, Messrs. P. S. Booth and R. R. Bailey.

"Phantestra" (Renn's Gramophone and Wireless), Ltd.—First meetings of creditors and contributories, June 6th, at Carey Street, W.C.

Engineers' Club (London), Ltd.—First meeting of creditors and contributories June 12th, at Bankruptcy Buildings (Room 53), Carey Street, Lincoln's Inn, W.C.2.

Chemico-Electric Co., Ltd.—Winding up voluntarily. Liquidator, Mr. A. J. Bennell, 7 & 8, Norfolk Street, Strand, W.C.2.

Kings Inventions (Electric), Ltd.—Winding up voluntarily. Liquidator, Mr. G. Hardman Ashworth.

Private Arrangements.

H. W. Smith, radio retailer, trading as the Broadmead Wireless Co., Bristol.—At a recent meeting of creditors a statement of affairs was submitted showing ranking liabilities of £1,810 and net assets of £812, leaving a deficiency of £998, which was attributed to a loss on trading and depreciation written off assets. In the absence of any offer, it was decided that the matter should be dealt with under a deed of assignment, with Mr. A. Taylor, Exchange Chambers, Corn Street, Bristol, as trustee, with a committee consisting of the representatives of Messrs. F. Burris & Son, the Marconiphone Co., Ltd., and Poppleton & Appleby. The principal creditors are:—

	£		£
H. Maddrick	105	Marconiphone Co., Ltd.	167
K. Smith	50	F. Burris & Son	186
Kolster-Brandes, Ltd. ...	77	National Electric Co. ...	57
Philips Lamps, Ltd. ...	64	Southern Factors, Ltd.	50

A. Shaw, electrical engineer and contractor, 66 and 68, Brook Street, Hull.—A meeting of creditors was held recently, when a statement of affairs was submitted which disclosed liabilities of £6,425 and net assets of £3,872, leaving a deficiency of £2,553. The present position was attributed to heavy overhead expenses and losses on contracts. Owing to pressing creditors, a deed of assignment had already been executed to Mr. W. B. Hall, National Provincial Chambers, Silver Street, Hull. It was stated that the claim of the executors of debtor's father would be postponed, and a resolution was passed confirming the deed, whilst a committee of three of the principal creditors was also nominated.

S. K. Y. Cochrane, trading as "The Popular Wireless Stores," 26, Moorfields, Liverpool, and at Wallasey.—A meeting of creditors was held on May 27th at the offices of Mr. P. S. Booth, Exchange Chambers, Bixteth Street, Liverpool. The statement of affairs showed liabilities of £227 and net assets of 14s., leaving a deficiency of £226. A deed of assignment already executed to Mr. Booth was confirmed, and the debtor was requested to endeavour to make an offer of at least 2s. in the £.

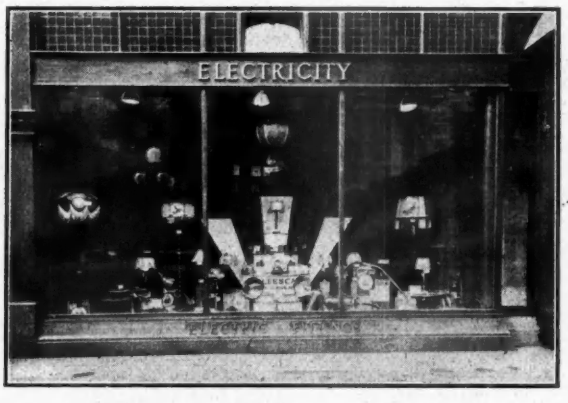
F. W. Simkins, trading as Broadway Radio Supplies and the Corner Cabinet Works, Harrow.—A meeting of the creditors was held on May 26th, when a statement of affairs presented disclosed liabilities of £250 and net assets of £163, leaving a deficiency of £89. The creditors decided to confirm a deed of assignment already executed in favour of Mr. E. H. Hawkins as trustee and to accept the debtor's offer of 10s. in the £.

Deed of Assignment.

A. Holmes, J. H. Holmes, E. Holmes and S. Holmes, trading as J. H. Holmes & Co., W. H. Holmes & Sons, and the Castle Brand Co.—The trustees under this deed of assignment state that there are still some book debts outstanding on the joint estate, but the cause which delays the final winding up is the difficulty in realising the remaining assets of the separate estates of the partners. That of S. Holmes has been finally wound up. It is expected that the final dividend to the joint creditors will be about 1s. in the £ and that the realisations will be completed within six months. Two dividends totalling 10s. in the £ have already been paid.

A London Supply Company's Display.

A special window display, which has attracted a good deal of attention, has been arranged by the Brompton and Kensington Electricity Supply Co., Ltd., at its showrooms in Kensington. The display consists of "Efesca" domestic electrical appliances and fittings provided by Messrs. Falk, Stadelmann and Co., Ltd., and the attractive lay-out of the window is shown in the accompanying illustration.



An "Efesca" Domestic Appliance Display.

New Italian Companies.

Among the companies recently formed in Italy are the Società Verbanes di Elettricita, Milan, capital 100,000 lire; La Società Riscaldamento Elettrico, Milan, to manufacture electric heating appliances; and La Società Pila Accumulatrice, Milan, to manufacture batteries.

New Indian Companies.

Among the concerns recently organised in India are the Khulna Electric Supply Corporation, Khulna, Bengal, capital 400,000 rupees; the Comilla Electric Supply Co., Comilla, Bengal, 150,000 rupees; and the Reliance Electric Supply Corporation, Ramnad, Madras, 500,000 rupees.

Italian Lamp Production.

The production of electric lamps in Italy during November last amounted to 2,044,600, bringing up the total for the first eleven months of the year to 20,283,815, as compared with 14,455,723 in the corresponding period of the preceding year.

Exhibition of Inventions.

The sixth International Exhibition of Inventions will be held from October 1st to 11th inclusive at the Central Hall, Westminster. As in previous years, the exhibition will include a trade section and a new inventions section in which devices which have not yet been placed on the market will be shown.

Electrical Engineering Production.

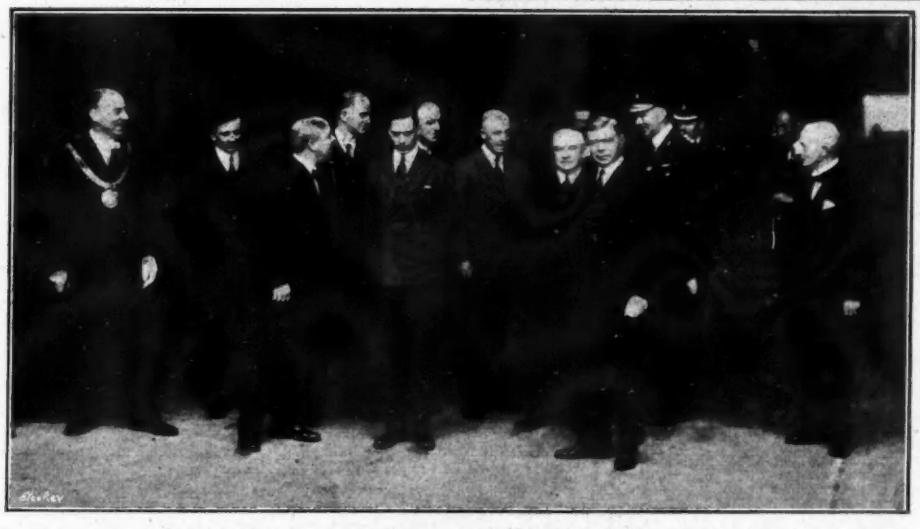
The B.E.A.M.A. Index of Production for April shows that there was a decline, the first for over a year. With the 1924 production as a basis (100), the April figure was 113.6. In March it was 118.8 and the average for the first quarter of the year was 116.4. The figure for the corresponding month of last year, however was 105.2.

The Board of Trade index for the March quarter gives a production figure of 110.9 (1924-100) for industry as a whole. This was slightly higher than that for the corresponding quarter of 1929 (110.5). Excluding mines and quarries the production figure was 113.2, as compared with 113.4 in the March quarter of last year. The greatest improvement upon the 1924 level is shown by the engineering and shipbuilding industries for which the index is 125.7 against 120.0 for the corresponding quarter of last year.

Royal Visit to the A.T.M. Works.

On May 20th, under the ægis of the Industrial Welfare Society, the Duke of York visited the Strowger works of the Automatic Telephone Manufacturing Co., Ltd., and made a tour of the principal departments. The Duke was received by Mr. G. W. Moore, director and general manager, and was conducted to the company's laboratories where he saw Strowger automatic components being subjected to drastic "life tests." He was also shown voice fluctuations reproduced graphically on a screen with the aid of an oscillograph, and was given a demonstration of the A.T.M. all-electric totalisator as installed at Newmarket. Passing next to the machine shops, the Duke was interested in the many intricate processes incidental to the manufacture of Strowger dial telephones and automatic exchange equipment, and he paid special attention to the guards and safety devices fitted to the presses and other machines for the protection of operatives. In the switchboard department he witnessed the wiring of Strowger switches, and operated a Strowgerphone. Here he was presented with a souvenir of the visit in the form of a Strowger calling dial, appropriately inscribed, and mounted as a paperweight. He then proceeded with the final stage of the tour which included an inspection of the Assembly Department where the many detail parts of Strowger switches are built up into complete components.

Fig. 1.—The Duke Watches Operations.



The Lord Mayor (Mr. Lawrence D. Holt); Mr. J. Nixon (works manager); Mr. G. W. Moore (director and general manager); Mr. T. A. Eades (assistant manager); H.R.H. the Duke of York; Mr. F. J. Marquis; Mr. A. F. Bennett (chief engineer); Sir Benjamin Johnson; Mr. Robert Hyde (director, Industrial Welfare Society); Mr. L. D. L. Everett (chief constable); Mr. Glover (assistant chief constable); Mr. A. R. Dodd (secretary).

Fig. 2.—The Duke of York, with Officials, at the A.T.M. Works.

Trade Announcements.

As from June 2nd, "Cosmos" lamps are being sold through the Lamp Sales Department of the METROPOLITAN-VICKERS ELECTRICAL CO., LTD. For the time being and until further notice they will be sold from existing depôts. "Cosmos" lamps will be the subject of an intensive advertising campaign beginning in the early autumn.

The wiring supplies, lighting engineering and radio business of Metro-Vick Supplies has been taken over by the EDISON SWAN ELECTRIC CO., LTD., 123-5, Queen Victoria Street, E.C.4, as from June 2nd. The company has issued a brochure to the trade detailing the equipment dealt with and showing the various branches in the British Isles.

The BELGRAVE ELECTRIC CO. has opened a small showroom at 24, Belgrave Road, Victoria, S.W.1, and asks for manufacturers' catalogues and publicity matter.

The JACKSON ELECTRIC STOVE CO., LTD., is closing down from to-morrow (Saturday) mid-day until Wednesday morning next for the Whitsun holidays.

The TELLUS SUPER VACUUM CLEANER, LTD., has opened new showrooms and offices at 2, Coliseum Chambers, 24, Chandos Street, W.C.2, for demonstrating the various models of its vacuum cleaner.

Mr. A. R. Wallace, late of Davenport Accessories, Ltd., 12, Pembroke Street, N.1, has been appointed a representative of Messrs. D. H. BONELLA & SONS, LTD., 46-8, Osnaburgh Street, N.W.1., manufacturers of motorcar and electrical accessories.

Book Notices.

"The Future of Empire Trade," by J. E. Ray. (128 pp.) London: Sir Isaac Pitman & Sons, Ltd. Price 2s. net.—This is a useful handbook upon the resources, trade and industry of the Empire by a former Canadian Trade Commissioner. The author studies the trend of inter-Imperial trade and relates it to such matters as preferential tariffs, migration and Empire development. He stresses the need for education on Imperial lines, with special reference to salesmanship, and concludes with an estimate of the possibilities inherent in closer trade contact with the Dominions. By implication Mr. Ray supports the activities of the Department of Overseas Trade but would like to see a stronger organisation on the lines of the United States Bureau of Foreign and Domestic Commerce.

"The Compulsory Taking of Land by Public Companies and Local Authorities," by Thomas Waghorn, revised by R. Borregard, M.A. (134 pp.). London: Effingham Wilson. Price 5s. net.

The preface says that this new edition, the third, has been rendered necessary by the distinction made by the Acquisition of Land (Assessment of Compensation) Act between the compulsory purchase of land by private promotors and undertakings on the one hand and Government and public authorities on the other.

"Faraday House Journal," Vol. XIII, No. 6, Summer Term, 1930.—Besides the usual notes and notices, the articles include one on "A Two- to Twelve-phase Transformer," by E. Gledhill, and another on "The Transmission of Electrical Energy to the Larger Consumers on a City Network," by G. H. Adams.

Copies of the eight papers presented by members of the Institution of Chemical Engineers at the World Engineering Congress held at Tokio, Japan, in October-November, 1929,

have been bound in stiff boards and are now available from the Institution in London at the price of 10s. 6d. each set.

We congratulate our Russian contemporary *Electritchestvo* upon attaining its jubilee, the journal having been founded in 1880. The event was celebrated in Moscow and Leningrad a few days ago.

"Electric Furnaces for Steel Melting."—This is a reprint issued by the Metropolitan-Vickers Electrical Co., Ltd., of a paper read by Messrs. N. Ryland Davis and C. R. Burch before the Manchester Association of Engineers.

"Distribution of Electricity" (Henley's House Journal), No. 25, Vol. 3, Second Birthday Number.—Contains some interesting photographs of the recent I.M.E.A. Convention at Eastbourne.

"*Journal* of Research of the U.S.A. Bureau of Standards." Vols. 3 and 4, March and April, 1930. Price, 40 cents each.

"Notes on the Hardness of Testing Materials." Pp. 16; figs. 11. London: Wild-Barfield Electric Furnaces, Ltd.

"A Handbook of Refrigerating Engineering," by W. R. Woolrich. Pp. 331. Illustrated. London: The Library Press, Ltd. Price 20s. net.

"*Journal* of the American Institute of Electrical Engineers," Vol. XLIX, May, 1930. New York: The Institute, $1.

The "Exide" Convention at Edinburgh.

The tenth "Exide" Convention, which concluded on May 30th, after five busy days, is said to have broken all previous records. The delegates and their ladies had much to praise in the well-organised series of meetings, feastings and excursions devised for their entertainment and instruction. At some of the functions Mr. D. P. Dunne, chairman of the Convention, presided over nearly 500 guests and everywhere throughout the stay in Edinburgh the popular Service Manager, Mr. G. S. Harvey, was in evidence. The North British Hotel, Edinburgh, was practically monopolised by the "Exide" delegates for a week and was transformed into an exhibition of batteries, battery plant, and accessories and up-to-date examples of advertising. An elaborate system of "Celestion" loud-speakers was installed and so connected that the microphones could be switched off separately if desired. The mornings were mostly devoted to lectures and discussions and the remainder of the days to companionship and pleasure. Gleneagles, Peebles, Longniddry, the Forth Bridge, and other places of local interest and beauty were visited, and on May 28th a great banquet was held at which the Lord Provost of Edinburgh was a guest. At the banquet one of the most enjoyable speeches was made by ex-Provost Sir W. L. Sleigh who, replying for "Exide Service Agents," said that he had attended many banquets in Edinburgh, but never one so great. They knew something about electricity in Edinburgh for they had a splendid super-station. They knew also the advantage of "potted electricity." The storage battery in connection with the motor industry and wireless was a great boon.

"Exide" Service Agents in Conference.

Mr. Dunne in some concluding remarks ventured to prophesy that the coming of the grid, instead of limiting the need for large and medium power storage batteries, would ultimately have the effect of stimulating demand for them to level the consumers' load and afford security. We reproduce a photograph taken at one of the sessions.

E.D.A. Activities.

The British Electrical Development Association has commenced an Electrical Refrigeration Campaign to increase the demand for British refrigerators. The scheme includes a special window display (illustrated in our last issue) which is being offered free of charge to members having showrooms. Other activities in connection with the campaign include a set of circular letters prepared by the Association for issue to householders, dairymen, butchers, hotels, cafés, boarding houses, &c., and a number of attractive folders and booklets suggesting why these consumers should use refrigerators. In addition to the above, the Association has prepared a lecture entitled "Refrigeration and All about It."

Industrial Electrification in Sweden.

Statistics published recently by the Swedish Board of Trade show that Sweden has made rapid progress in the use of electricity for industrial purposes. The total h.p. of electric motors installed in 1928 was 1,407,048, representing 79 per cent. of the power used in industry. In the same year industry consumed 83 per cent. of the electricity generated in Sweden. The following branches are more than 90 per cent. electrified:—Ore mines, machine shops, the textile industry, the leather, hair and rubber goods industry, and the "chemical-technical" industry. The post-war pulp and paper mills are fully electrified; in 1928 these mills consumed 52 per cent. of the 1,080 million kWh taken by Swedish industry.

For Sale.

The Irish Free State Electricity Supply Board has for disposal alternators, dynamos and boilers.

Mr. E. Fryett is to sell by auction at the London Trade Sale Rooms, 78 and 81, Fetter Lane, E.C., electrical goods and material.

(See our advertisement pages to-day.)

Social Events.

At a recent meeting of the Electric Lodge, held at the Monico Restaurant, Bro. J. B. Marr installed Bro. C. J. Margerison as his successor in the office of Master. Preceding the installation, the business of the lodge included the presentation of Grand Lodge certificates to Bros. P. W. and L. Rands and Bro. Fansett. The gathering numbered over 70. Among the visitors were Bro. Obed. Smith, P.A.G.St. B. (of Canada), who replied to the visitors' toast, Bro. Ernest Briggs (Namaqualand), Bro. R. E. Hisler, P.G.S., Bro. A. T. Pickroy, W.M., of the Mendelsohn Lodge No. 2661, and Bro. C. E. Miles, W.M., of the Whittington Lodge No. 862. The officers appointed by Bro. C. J. Margerison for the ensuing year were as follows:—Bros. F. W. Marshall, S.W., H. G. White, J.W., S. E. Burrows, Treasurer, E. J. Willcock, Secretary, H. Porter-Cox, D.C., G. W. Rogers, S.D., H. G. Hughes, J.D., A. J. Cherry, Asst. D.C., B. G. Stewart, Almoner, J. Horne, I.G., C. T. J. Opperman, A. S. Markes and H. R. Lloyd, Stewards, and H. Francis, Tyler.

In the Dr. Wright golf competition, the first of the annual competitions held by the staff of Siemens Lamp Works, Preston, the prize winners were J. N. Aldington, L. W. Smith and W. G. Creasy. The competition took the form of 18 holes medal play, and was played on the links of the Dick Kerr Club at Ashton Park.

The spring meeting of the Engineers' Golfing Society was held at Sunningdale on Thursday, May 29th, 51 members taking part in the competitions. In the morning there was a medal round, the winners being Messrs. J. R. Dallmeyer, R. E. Docwra, H. P. Gaze, W. E. Lane, and W. Phillips. In the afternoon four-ball foursomes were played against bogey, the winners for these matches being Messrs. S. Groom and S. E. Page. The prizes were distributed by the President, Sir R. A. Hadfield.

Prices of Materials.

Messrs. Edward Till & Co. report, June 3rd: No change in the price of india-rubber, Para fine.

Messrs F. Smith & Co. and Messrs. James & Shakespeare report, June 3rd: No change in copper prices.

Messrs. James & Shakespeare report, June 3rd: No change in the price of English pig lead.

Reporting on May 31st, Messrs. James Forster & Co. said that a very quiet tone prevailed in the lead market last week. The opening was a little firmer, but prices eased and closed a little lower on the week. Very quiet conditions also rule outside the market, little business passing with consumers. Supplies are ample, while the anticipated heavy arrivals during June have caused speculators to pay dealers 5s. per ton to carry over their commitments for three months. Present conditions seem likely to continue for a time, when it will be a question as to whether consumers will be in a position to absorb incoming supplies.

Central Electricity Board Contracts.

The Central Electricity Board has recently placed contracts, amounting approximately to £326,000, for works in connection with various schemes, including the following:—

(1) For 66-kV, 33-kV and lower voltage transformers in the areas of the North-West England and North Wales and Mid-East England Schemes: The British Thomson-Houston Co., Ltd.; the Brush Electrical Engineering Co., Ltd.; the English Electric Co., Ltd.; Messrs. Ferranti, Ltd.; and Messrs. C. A. Parsons & Co., Ltd.

(2) For oil filtering and storage equipment for outdoor transforming stations in the area of the Central England Scheme: Super-Centrifugal Engineers, Ltd.

Lighting and Power Notes.

Barking.—MAINS EXTENSIONS.—The Urban District Council Electricity Committee has authorised the electrical engineer to proceed with the laying of a main in Longbridge Road at a cost of £1,482.

Blackpool.—YEAR'S WORKING.—The annual statement of the Corporation electrical engineer shows that the total output for the past financial year was 41,026,450 kWh, an increase of 3,000,000 kWh as compared with the previous year. Thirty miles of new mains and distributors were laid during the year. New consumers numbered 1,687 and the surplus, after providing for capital charges, was £35,876. Of the 41,000,000 kWh, 28,000,000 kWh was purchased from Preston and 12,000,000 kWh generated at Blackpool.

Buckie.—INQUIRY.—An inquiry in connection with the Special Order applied for by the Town Council was opened on May 27th by Mr. Henry Nimmo, principal engineering inspector of the Electricity Commissioners. The application was opposed by the local gas company and the Grampian Electric Supply Co. Provost Merson, who gave evidence for the promoters of the Order, said that electricity in Buckie would not only be commercially successful, but would be eagerly taken up. He had heard of another company willing to light the north-east of Scotland besides the Grampian Co.—Sir Murdoch Macdonald and his firm. He had been informed that the latter's investigations into the North-Eastern Scotland Scheme were finished and everything was ready for its Order to go forward; the company was prepared to supply electricity to towns in the North-East in bulk and the Order was to be in opposition to that of the Grampian Company, which was to be promoted shortly.

The plans of the Grampian Electricity Supply Co. for supplying the north-east of Scotland were disclosed by Mr. H. Partington, general manager, who said that he expected that company's application for an Order would be made in a month. The Grampian company's advantage would be its ability to supply power from h.p. mains; it was proposed to erect a 30,000-V ring main round the coast. The main would run from Rannoch *via* Stonehaven, Kintore, and Fochabers, with another taking in Peterhead and the Moray Firth coast. The company was prepared to erect a temporary station at Buckie, where the plant would be transportable. Mr. Patrick, for the Grampian Company, asked that the decision regarding Buckie should be postponed until the company's application could be considered. The Grampian Company's proposal, he pointed out, offered Buckie electricity at 8d. per kWh, with no risk whatever, within two years. Mr. Keith, for the promoters, argued that they had no guarantee that Buckie could be supplied in two years by the Grampian Company. The inquiry then closed and the decision will be given later.

Bury (Lancs.).—MAINS EXTENSIONS.—The Town Council has instructed the electrical engineer to arrange for house and street lighting by electricity, for the Woolfold and Walmersley housing schemes.

Cheltenham.—MAINS EXTENSIONS.—At a recent meeting of the Corporation Electricity Committee the borough electrical engineer submitted a scheme and plans for the extension of the mains to supply the rural areas included in the Extension Order, and recommended a supply to Bishop's Cleeve and Woodmancote. The Committee decided to proceed with the scheme at a cost of £5,936.

HIRE-PURCHASE SCHEME.—The Electricity Committee further considered the proposed hire-purchase scheme. The chairman reported that at a conference with the local contractors, when the scheme was fully explained, the contractors passed a resolution supporting it and asked that it should be put into operation as soon as possible. The town clerk submitted a draft hire-purchase agreement, which was approved.

Clitheroe.—DOMESTIC APPLIANCE EXPERIMENT.—As an experiment it has been decided by the Corporation to install an electric washboiler, cooker, and kettle in each of six Corporation houses. In addition to paying for the electricity used, tenants of the houses are to pay 1s. 3d. a week—1s. 2d. in respect of the all-in rate and 1d. for the hire of the cooker.

Continental.—AUSTRIA.—An Austro-Swiss-German syndicate has recently applied to the Austrian Government for a concession to establish a large hydro-electric power station on the River Inn, near Martinsbruck. The scheme comprises the construction of a dam to form a lake with a storage capacity of over 165 million gals.

SWITZERLAND.—During last year three new hydro-electric power stations, with an aggregate capacity of 94,000 h.p., were completed and put into operation in Switzerland, bringing up the total capacity of installed plant for water-power utilisation in the country to 2,236,000 h.p. At the end of the year work was also in progress on the construction of six more hydro-electric plants with a combined capacity of 328,000 h.p. It is estimated that last year the output of hydro-electric power amounted to about 5,300 million kWh, an increase of 150 million kWh as compared with 1928, or approximately 1,300 kWh per head of the population.

Two villages and part of a third, involving in all 45 farms, which provide the livelihood of 560 people, would be submerged under a scheme for the creation of an artificial lake in the Upper Rhine Valley which was recently discussed at a public meeting at Coire (Upper Rhine). The scheme, which includes the construction of a large power station, would take from ten to twenty years to complete and cost approximately £8,000,000. The scheme was opposed by spokesmen of the Upper Rhine and the meeting ended without a decision being reached.—*Reuter* (Berne).

BELGIUM.—A new 25,000-kW turbo-generator set has recently been added to the power station at Langerbrugge of the Société des Centrales Electriques des Flandres et du Brabant. A second set of similar capacity is in course of erection which will bring the capacity of the plant up to 110,000 kW. In conjunction with the Société Intercommunale Belge d'Electricité, the company has decided on the establishment of a 150,000-V transmission line to connect the power stations at Sweveghem and Langerbrugge.

GERMANY.—The output of the 122 principal electric power stations in Germany during January and February last amounted to 2,949,800,000 kWh, as compared with 2,725,600,000 kWh in the corresponding period last year.

Coventry.—LOAN.—The Corporation Electricity Committee recommends that application be made for sanction to a loan of £10,168 for mains and switchgear.

Croydon.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains at a cost of £1,375.

Eastbourne.—LOAN.—The Corporation Electricity Committee is applying for sanction to the borrowing of £8,300 for electricity extensions.

Glasgow.—PROGRESS DURING APRIL.—Under the Corporation Electricity Department's scheme 770 houses were wired in April, bringing the total to date up to 22,813, while hired appliances installed numbered 33, making the total to date 20,315.

MAINS EXTENSIONS.—The Corporation Electricity Committee recommends extensions of distributing mains at an estimated cost of £7,282.

Guildford.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains to Newlands Corner Hotel, at a cost of £1,136, and to houses on the Dagley Estate, Shalford, at an estimated cost of £246.

OVERHEAD LINES.—The Electricity Committee has applied for the consent of the Hambledon Rural District Council and the Ministry of Transport to the erection of overhead lines to augment the supply in the Guildown area. The estimated cost of the scheme, including the conversion of consumers' appliances, is £2,350.

Japan.—NEW PLANT.—The Seitetsusho has decided to install an additional 20,000-kW generator at its No. 4 power station, at a cost of approximately 2,500,000 yen.

Lancaster.—NEW SWITCHGEAR.—In connection with the grid scheme, the borough engineer has been authorised to obtain tenders for the provision and erection of the necessary switchgear at Caton power station and Beaumont estate, at a cost not exceeding £7,500. Sanction to a loan for that amount is being applied for.

Llantarnam.—INAUGURATION OF SUPPLY.—The official inauguration of the Urban District Council's scheme for supplying electricity to the district was performed on May 22nd by Mr. Charles Brown, chairman of the Council, at the substation in Abbey Road. The supply is taken in bulk from the South Wales Electrical Power Distribution Co.

Maidstone.—PUBLIC LIGHTING.—The Town Council has arranged with the parish councils for public lighting by electricity at East Malling, Ditton and Linton. A supply is also to be given to the Malling Rural District Council's Isolation Hospital.

Middlesex.—MAINS EXTENSIONS.—The County Council has voted £2,600 for the main cables required in connection with the electricity supply for the Middlesex County Hospital and colony at Porters Park.

Northern Ireland.—OMAGH (CO. TYRONE).—An inquiry into the proposed electricity scheme for the town was held on May 22nd by Mr. J. H. Munroe. Several witnesses said that there was no general demand for electricity and that some 75 per cent. of the merchants and tradespeople of the town were against the scheme. For the Urban District Council, which has approved the scheme, it was put forward that the matter had been raised as far back as thirty years ago, and the fact that certain people were opposed to it did not affect the situation, as contemporary cases had shown that people who objected most had subsequently become enthusiastic supporters of such schemes. There was a general demand for electricity, and the existing gasworks was inadequate unless the Council spent £6,000 upon it.

Norwich.—LOANS.—The Corporation Electricity Committee is applying for sanction to loans of £10,500 for trunk lines in Norwich, £35,000 for main transmission lines outside the city, and £58,000 for h.p. mains outside the city.

Plymouth.—LOAN.—The Corporation Electricity Committee is applying for sanction to a loan of £20,000 for the City Council's scheme for free and assisted wiring and the hire-purchase of cookers and other domestic apparatus.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

HAMMERSMITH.—For consumers taking a minimum consumption for combined lighting and power purposes of 200,000 kWh per annum (lighting not to exceed 20 per cent.): 1.05d. per kWh. For consumers taking a minimum consumption for lighting and power purposes of 3,000,000 kWh per annum (lighting not to exceed 20 per cent.): A fixed charge of £4 per kW of maximum demand per annum, plus 0.45d. per kWh (subject to coal clause). Ice skating rinks, subject to a minimum consumption for lighting and power purposes between May 1st and September 30th (lighting not to exceed 20 per cent.) of 170,000 kWh: October 1st to April 30th, 1.05d. per kWh; May 1st to September 30th, 0.6d. per kWh.

SWINDON.—Lighting: From 5d. to 4d. per kWh. Power: From 2½d. to 2d. per kWh. Heating: From 1½d. to 1d. per kWh.

HOYLAKE AND WEST KIRBY.—Heating and cooking: A reduction of ½d. per kWh. Power: A reduction of ½d. per kWh. Street lighting: From 5d. to 4½d. per kWh. Baking ovens and water heating: ¾d. per kWh during specified hours (minimum of 1,500 kWh per quarter).

LOWESTOFT.—Lighting: From 7d. to 5½d. per kWh. Cooking and heating: A reduction of ½d. per kWh. Power: A reduction of ½d. per kWh. Alternative domestic tariff: A fixed charge of 15 per cent. per annum of rateable value, plus 1½d. per kWh consumed. For consumers in Kessingland it is recommended that electricity for lighting should be charged at 6½d. per kWh, cooking and heating at 1½d., and power at 2½d. per kWh.

WORTHING.—Lighting: To 5½d. per kWh. Heating and power: To 1d. per kWh.

Ripon.—ASSISTED WIRING SCHEME.—The Corporation Electricity Committee has agreed to the principle of assisted wiring, and instructed the city engineer to prepare a scheme and ascertain to what extent the local electrical contractors are prepared to co-operate in working it. The Committee is to apply for sanction to a loan of £2,000 for assisted wiring and £1,000 for showroom appliances.

Rochdale.—YEAR'S WORKING.—The Corporation Electricity Department for the financial year ended March 31st last, yielded a net profit of £3,428 after meeting all charges for interest and sinking fund. This surplus is being utilised towards the purchase of domestic appliances for hire. The revenue from the hire of domestic appliances increased from £3,305 to £5,246. The average price of electricity per kWh sold showed a decrease from 0.838d. to 0.813d., the total sales of electricity being 89,763,582 kWh, as against 79,980,635 kWh.

Salford.—LOAN.—The Corporation Electricity Committee is applying for sanction to the borrowing of £1,000 for alterations and additions to the 6,600-V switchgear at the Blackfriars sub-station

Scarborough.—ELECTRICITY CHARGES IN FILEY.—The Town Council has fixed the prices to be charged for electricity in the Filey urban district at 10 per cent. above those in operation at Scarborough.

Shipley.—LOAN SANCTIONED.—The Urban District Council Electricity Committee has received sanction to the borrowing of £9,969 for mains.

Southend-on-Sea.—DIESEL ENGINE FOR PEAK LOADS.—At a meeting of the Town Council held recently the electrical engineer reported an offer from a firm of Diesel engine makers of a new 3,000-kW Diesel set for £28,000, including maintenance for three years. The Electricity Committee, having considered the economic advantages of Diesel engines for peak loads, and having regard to the low capital cost (£9 per kW) which the purchase of the plant would involve, decided to communicate with the Electricity Commissioners on the matter.

NEW ELECTRICITY CHARGES.—The Town Council has adopted the following new tariffs:—Two-part tariff: A standard charge of £3 10s. per half year per kW of maximum demand (d.c. supplies), or £3 per half year per kVA of maximum demand (a.c. supplies), plus ½d. per kWh, provided that the average charge made to the consumer for any half-year shall not exceed 3d. per kWh; the meter rent is to be £4 per annum, and the tariff is not available for motor generators or to consumers having a demand of less than 3 kVA. Restricted hour tariff: 1½d. per kWh, plus a fixed charge of £5 10s. per annum in lieu of meter rent (no energy to be consumed between 4 p.m. and 10 p.m. during six months of each year). Industrial heating and cooking for hotels, boarding houses, nursing homes, institutions, &c.: ½d. per kWh, with a fixed charge of £4 per annum in lieu of meter rent (minimum consumption of 1,000 kWh per quarter). Outdoor illumination during summer months: 3½d. per kWh.

South Shields.—PUBLIC LIGHTING.—An inquiry was held recently by Mr. G. Ewart Rhodes, of the Ministry of Health, into a proposal of the Corporation to expend £50,057 to convert to electricity all the gas lamps in the borough. Of this sum, £42,865 is for the laying of mains and £7,192 for conversion of the lamps. An application for a grant has also been made to the Unemployment Grants Committee.

South-West England and South Wales Electricity Scheme.—The Central Electricity Board has adopted the South-West England and South Wales Electricity Scheme transmitted to it by the Electricity Commissioners. (See advertisement in this issue.)

Special Orders.—Applications for Special Orders are to be made by the Barrow-in-Furness Corporation to extend its supply area so as to include parts of the rural districts of Alverston and South Westmorland; and by the Cleveland and Durham County Electric Power Co. to supply electricity in part of the rural district of Crook.

The Electricity Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Shropshire, Worcestershire & Staffordshire Electric Power Co. to supply electricity in the rural district of Newent; the Norwich Corporation to supply electricity in parts of the rural districts of Aylsham, Depwade, Loddon and Clavering, Mitford and Launditch, St. Faith's and Smallburgh; and the West Hampshire Electricity Co., Ltd., to supply electricity in parts of the rural districts of Alresford, Droxford, and Winchester.

Swansea.—HOSPITAL HEATING QUESTION.—The controversy at Swansea over the question as to whether the Swansea and Merthyr Joint Mental Hospital shall be heated by electricity or coal firing again came up at a recent meeting of the Town Council, when Councillor Hughes, who advocates coal firing, was informed that the contract had not been placed, and that before it was approved an opportunity would be given for consideration of the relative merits of coal and electricity. The Joint Mental Hospital Committee favours an all-electric installation.

Winchester.—INAUGURATION OF SUPPLY TO NEIGHBOURING VILLAGES.—The Corporation's scheme for the supply of electricity to the villages of Twyford, Compton and Shawford was formally inaugurated on May 21st by the Mayor of Winchester.

Tramway and Railway Notes.

Australia.—MELBOURNE.—The Melbourne Tramways Board having made successful arrangements for a loan of £200,000, tenders for the work of converting the Brunswick Street cable tramways to electric traction are to be invited immediately.

Blackburn.—YEAR'S WORKING.—The annual report of the Corporation's tramway manager shows an income for the year ended March 31st last of £102,714, as against £109,468 for the previous year. There was a decrease in car-mileage of 6,480 and a reduction in the number of passengers of 145,816. The deficiency for the year was £1,031 as against a favourable balance of £1,445 for the previous year. The manager considers that the depressed state of trade and the reduction in fares are responsible for the decreased revenue. The Department has suffered considerably from 'bus competition on the Accrington and Wilpshire sections.

Continental.—BELGIUM.—The Société Nationale des Chemins de Fer Vicinaux is gradually electrifying its system of local steam railways. The work of converting the line between Anderlues and Thuin has just been completed, while the section between Brussels and Sterrebeek is approaching completion. Other lines, the electrification of which is about to be taken in hand, are those in the Ghent, Mons, and Courtrai districts; those between Boussie and the frontier; Haine St. Pierre and Morlanwelz; Brussels and Hal; Braine l'Alleud and Rixensart; Brussels and Londerzeel; Antwerp and Tillo; Antwerp and Lierre; Antwerp and Tamise; Ans and Oreye; and Bruges and Knocke.

ITALY.—The work of electrification of the Simplon section of the railway between Isella and Domodossola has been completed and the line was opened to traffic on May 15th. It is stated that there is a saving of 20 minutes on the upward journey and 10 minutes on the downward trip.

SWITZERLAND.—The Swiss Federal Railway Authorities are shortly to give out orders for an additional twenty electric locomotives.

Doncaster.—RAILLESS CARS.—The Town Council has decided to apply to the Ministry of Transport for sanction to convert the Balby and Warmsworth tramways to railless traction.

Edinburgh.—THE SMOKE NUISANCE.—The Corporation is to be asked to consider a proposal that it should apply for powers to make it compulsory for all railways within the city boundaries to be converted to electric or other approved method of traction. It is claimed that if such conversion were made it would do away with the smoke nuisance. It is also recommended that a meeting should be arranged with the railway companies to discuss the matter.

Hull.—RAILLESS CARS.—The Corporation Tramways Committee has resolved to apply to Parliament for general powers to run railless cars.

Japan.—ELECTROMAGNETIC BRAKES FOR GOVERNMENT RAILWAYS.—As a result of experiments, the I.G.R. has decided to fit electromagnetic brakes on some of its electric trains. Mr. Otsuki, engineer of the Railway Department Engineering Bureau, is completing the design for a standard type of brake, and it is expected that steps will be taken shortly for its construction.

Liverpool.—EXTENSION OF TIME.—The Corporation is to apply to the Minister of Transport for an extension of the time limited for the completion of the following tramways:—(*a*) Allerton Road, Wavertree, to Speke Road, Garston, until October 31st, 1931; (*b*) Ullet Road, until May 25th, 1931; and (*c*) Lake Road to Mill Lane, Mill Street to Dingle Lane, Marybone to Bevington Hill, and Brownlow Hill to Paddington, until July 31st, 1931.

London.—TRAMWAY RECONSTRUCTION.—The London County Council is to reconstruct the tramway on the overhead system of electricity collection in connection with the widening of Putney Bridge and its approaches.

FLOODS SUSPEND TRAIN SERVICE.—The torrential rain on Monday last flooded the track at Dalston Junction and caused the suspension of the L.M.S. electric service between Broad Street and Richmond from 7 to 9-30 p.m.

LEICESTER SQUARE TUBE STATION RECONSTRUCTION.—Work will be commenced shortly on the reconstruction of the Leicester Square tube station on lines similar to those of the new Piccadilly Circus station. The estimated cost of the new station is £400,000.

Telegraph and Telephone Notes.

Argentina.—TELEPHONY.—Following upon the absorption of the United River Plate Telephone and Telegraph Corporation and the Sociedad Co-operativa Telefonica by the International Telephone and Telegraph Corporation, the telephone service in the Argentine is making progress. Calls between Buenos Aires and the provinces are increasing rapidly; there are now 475 exchanges with a total of 221,262 subscribers, as compared with only 410 and 200,924, respectively, a year ago.

Hull.—TELEPHONE PROFIT.—For the year ended March 31st, 1930, a net profit of £11,968 was made by the Hull Corporation on its telephone undertaking. The gross profit was £38,156. Royalty tax paid to the Postmaster-General was £11,602, making a total from the commencement of the service of £164,112. The system is being gradually converted to the automatic system, and rentals for measured services have been reduced.

International Telephony.—RAPID GROWTH.—The usefulness and popularity of international telephony in Europe will be evident from the contents of the second edition of the international telephone directory, the Annuaire Telephonique International (A.T.I.). The first edition, published in July last, contained the names of some 12,000 subscribers; the second edition, to be released this month, will include the names of over 50,000 subscribers who have connections which necessitate foreign conversations.

ANGLO-ESTONIAN SERVICE.—The Postmaster-General announces the establishment, from June 2nd, of a public telephone service between this country and Estonia. Communication will be limited at the outset to calls between subscribers in the London telephone area and subscribers in Tallinn (Reval).

Poland.—RADIO-TELEPHONY.—The first telephone conversation between Warsaw (Poland) and Sydney (Australia) took place on May 20th, when a representative of the Polish Foreign Office talked with the honorary Polish Consul in that city. The connection was made *via* London.—*Reuter* (Warsaw).

Radio at Sea.—GUARD AGAINST PIRACY.—The danger of attack by pirates on ships sailing in Chinese waters is not infrequent. To obtain assistance when such an attack takes place reliance must be placed on wireless communication, and adequate protection must be afforded the operator and the installation. An effective solution of the problem has been supplied by the Marconi International Marine Communication Co., Ltd., by the development of an automatic transmitter fitted in a fireproof safe and equipped with the necessary power supply for immediate use. First brought out in 1924, the mere closing of a switch sets the transmitter in operation and the safe is then locked, leaving the transmitter secure from attack, while it radiates automatically the ship's call sign and the request for assistance uninterruptedly until either the necessary assistance arrives, or until (after some hours of continuous working) the batteries lose their charge. Pirates only attack coastal and river steamers, the positions of which are known practically from hour to hour; it is therefore unnecessary to transmit the position of the vessel attacked to the local coast stations, which inform all ships within range of the details and estimated position. The continuous radiation provides an excellent signal from which wireless directional bearings can be taken to facilitate the rescue work. The safe houses a standard ¼-kilowatt quenched-spark transmitter fitted with an automatic key in place of the ordinary operator's hand key, and no elaborate safety devices are necessary to protect it.

Radio Notes.

Australia.—IMPORTS.—The emergency tariff prohibiting the importation of completely or partly assembled radio receivers surprised importers. The Government's object in prohibiting importation is to cut down everything in the nature of luxuries, says *World-Radio*, with a view to restoring the trade balance which lately has been greatly against Australia. It is understood that the prohibition will not be permanent.

Amplifiers.—CRITICAL REVIEW.—Radio research special report No. 9 (Department of Scientific and Industrial Research, published by H.M. Stationery Office, price 5s. net) reviews the design of radio-receiver amplifiers and includes a general bibliography of the literature of the subject, which is believed to be complete from 1916 to April, 1929. Prepared at the National Physical Laboratory on behalf of the Radio Research Board with the object of indicating the lines along which future research may be profitably undertaken, the report should be valuable to students of the subject. The review is essentially critical, bringing out the relative importance of its different sections.

India.—BROADCASTING BOARD.—The Government of India has completed its selection of *personnel* for the new Indian Broadcasting Board. It will have as chairman the member of the Viceroy's Council concerned, and its other members will be two non-official members of the Legislative Assembly, two other non-officials, and two officials. Of the last named, says *The Times*, one will be a financial adviser, and the other will probably be selected for his administrative experience.

International Union.—SWISS MEETING.—A meeting of the International Broadcasting Union, including the annual general assembly, was held at Ouchy, near Lausanne, last month. The Postal Administration of Portugal (broadcasting section) and Radio-Ljubljana, of Yugo-slavia, were admitted to active membership, and the Columbia broadcasting system of the United States to associate membership. Vice-Admiral C. D. Carpendale, C.B., was elected president of the Union for the sixth successive year. The Union, through its active and associate members, now represents 330 transmitting stations serving 22½ million households, a total of about 90 million individuals. Twenty-one European nations, through their postal administrations or broadcasting organisations, took part in the discussions during the week. It was announced that the Union was about to distribute to organisations interested in touring a booklet containing the conditions upon which wireless receiving sets may be introduced into and operated in the various European countries.

A conversation by telephone with Australian postal and broadcasting officials took place on May 22nd from Lausanne, through Rugby, by Admiral Carpendale, president of the International Broadcasting Union, while the Union was in conference in Lausanne.

Italy.—NEW STATIONS.—The E.I.A.R. has organised a competition for four new types of receiving sets as an additional impetus to national industry in general. One type of set is to be capable of receiving on the 15-100 metres band, and should not possess more than three or four valves. The E.I.A.R. is particularly anxious to encourage short-wave transmission, which enterprise forms part of the programme which Signor Ciano, Minister of Posts and Communications, whose scheme also includes the opening of new stations, so that listeners all over the peninsula will be able to hear, even with quite small sets, at least one of the national programmes. According to *World-Radio* it is anticipated that the new stations at Trieste and Palermo will be operating within a year. The original suggestion to remove the old 3-kW Rome transmitter to Palermo has been abandoned, and both the Trieste and Palermo stations will have completely new transmitters.

CENSUS.—A census of listeners is being conducted throughout the country. Special forms have been distributed which must be filled up by every householder, without exception, who must declare whether or not a wireless receiving set is used. The number of known listeners is at present 135,000.

Radio Exchange.—RAWTENSTALL.—Application has been made to the Rawtenstall Corporation by a firm of wireless engineers for permission to establish a wireless receiving station from which to distribute broadcast programmes. The firm proposes to erect a central receiving station and land lines to various parts of the district to which subscribers' connections can be made. The Corporation offered no objection to the project.

U.S.A.—WAVELENGTHS.—On May 2nd the Federal Radio Commission suspended until July 31st its recent order changing the frequencies of twenty-six radio stations. At the same time it abandoned the plan to grant any dissatisfied station a hearing on June 17th, which action was the result of the stay order issued by the Court of Appeals of the District of Columbia in the case of KYW, Chicago, which maintained that no hearing should take place until the appeal had been disposed of by the Court.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the Electrical Review containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—Melbourne.—July 30th. Victorian Railway Commissioners. Turbo-alternators, condensing plant, and control gear. (B.X. 6355.)*

Renewals for caustic soda primary cells. (B.X. 6441.)*

July 8th. Posts and Telegraphs Department. Telephonists' telephones. (B.X. 6352.)* Telephone generators. (B.X. 6376.)*

July 9th. City Council. Supply of totally-enclosed metal-clad switchgear. (B.X. 6401.)*

Belfast.—July 5th. Electricity Department. H.p. switchgear, transformer kiosks with h.p. and l.p. switchgear, and static transformers. (See this issue.)

Cardiff.—July 1st. Public Health Department. H.p. and l.p. switchboards, transformers, battery and charging plant for Llandough hospital. (See this issue.)

Dundee.—June 25th. Electricity Department. E.h.p. switchgear and bus-bar reactors in the Caroline Port power station. (See this issue.)

East Ham.—June 18th. Education Committee. Installation of electric lighting at the Monega and Sandringham schools. (May 23rd.)

Egypt.—Cairo.—August 17th. Mechanical Department. Ministry of Public Works. Supply and erection of fifteen electric pumping stations, with pumps, motors, switchgear, &c. Specifications, &c. (deposit £10 5s.) from the chief inspecting engineer Egyptian Government, 41, Tothill Street, S.W.1. Tenders to the Director-General, Mechanical and Electrical Department, Ministry of Public Works, Cairo.

July 26th. Ministry of the Interior. Supply and erection of a cooling tower for the electric power station at Assiout. (A.X. 9627.)*

Tor Quarantine.—June 30th. Ministry of Public Works. Generating unit with accessories, motors, and erection of transmission lines and cordon lighting round a camp. (B.X. 6466.)*

Glasgow.—June 9th. Electricity Department. Supply of l.p. paper insulated, one, two, three, and four core, and e.h.p. cables, small india-rubber cables and flexibles, electric cookers, meters and electric kettles during the year ending May 31st, 1931. (May 23rd.)

India.—June 23rd. India Store Department. Supply, delivery, and erection of 11,000- and 400-V a.c. and 220-V d.c. switchgear, power and control cables, &c., for Shanan power station. (May 16th.)

June 9th. Oil engine alternator set with switch and protective gear and cables. (B.X. 6445.)*

Irish Free State.—Mullingar (Co. Westmeath).—Installation of electrical wiring, lamps, &c., at the County Home and Hospital for the Westmeath Board of Health. J. O'Reilly, engineer, Castletowngeoghegan, Mullingar (returnable deposit £5).

Irvine (Ayrshire).—June 16th. Town Council. Electric lighting of 80 houses. Specifications (deposit £1 1s.) from A. R. Wilson, town clerk.

Isle of Thanet.—Joint Hospital Board.—Installation of electric light at Thanet Isolation Hospital, Haine, near Ramsgate. (See this issue.)

Leeds.—June 16th. Tramways Committee. 100 tramcar bodies; 100 tramcar trucks, including wheels and axles; 100 tramcar pneumatic brake equipments; 100 tramcar electrical equipments. Specification, &c., on receipt of deposit (£2) from R. L. Horsfield, general manager and engineer.

Leyton.—June 13th. Corporation. Installation of water heating apparatus at Newport Road school and re-wiring electric light installation, Farmer Road school. (May 30th.)

London.—Central Electricity Board.—June 11th. Supply, delivery, and erection of 33-kV transformers for the South-East England Electricity Scheme, 1927. (May 16th.)

Construction of site works, foundation works and buildings in the area of the North-West England and North Wales Electricity Scheme, 1928. (May 23rd.)

June 19th. Supply, delivery, and laying of 33-kV and other cables for the Central England Electricity Scheme, 1928. (May 23rd.)

June 23rd. Supply, delivery, and erection of 66,000-V and other cables for the Mid-East England Electricity Scheme, 1929. (May 23rd.)

June 30th. Metering equipment in the area of the Central England Electricity Scheme, 1928. (May 30th.)

June 27th. Pilot cables for the Central England Electricity Scheme, 1928. (See this issue.)

June 30th. 33,000-V and other cables for the South-East England Electricity Scheme, 1927. (See this issue.)

H.M. Office of Works.—June 9th. Electrical accessories. (May 30th.)

June 10th. Fuseboards and switches. (May 30th.)

Metropolitan Water Board.—June 20th. Supply for twelve months commencing August 1st of electric lamps. Form of tender from the chief engineer, at the offices of the Board.

Manchester.—June 18th. Public Health Committee. Heavy a.c. equipment, cables and lighting at new children's sanatorium, Abergele. Specification and form of tender (deposit £1 1s.) from city architect, Town Hall.

June 27th. Electricity Committee. Annual contract for 3-phase 6,600-V switchgear. Supervisory control gear, Cumberland Street sub-station. (See this issue.)

New Zealand.—Wellington.—Public Works Department. July 1st. 110-kV suspension insulators for the Waitaki Power Scheme. (B.X. 6443.)*

July 29th. Auxiliary turbines and generating sets. (B.X. 6356.)*

August 12th. 11-kV metal-clad switchgear and accessories for Mangahao. (B.X. 6455.)*

August 19th. Supply and delivery of three single-phase transformers for the Penrose sub-station. (B.X. 6427.)

October 7th. 110-kV and 50-kV switchgear and protective system for Arapuni Electric Power Scheme. (B.X. 6450.)* 50-kV switchgear and steelwork for Arapuni. (B.X. 6451.)*

Nottingham.—June 17th. Electricity Department. Supply of general stores for 12 months commencing July 1st, 1930. (May 23rd.)

Oldham.—June 20th. Public Assistance Committee. Supply of electric lamps and fittings to Rochdale Road Institution. Form of tender from Public Assistance Officer.

Oswestry.—June 14th. Electricity Department. Cables, switchgear and transformers. (May 30th.)

Scunthorpe and Frodingham.—June 18th. U.D.C. Wiring for electric lighting and power at public baths to be erected in Doncaster Road, Scunthorpe. Specifications and form of tender (deposit £2 2s.) from W. Farrar, engineer and surveyor, Council Offices.

Sleaford.—June 11th. Electricity Department. Armoured, lead-covered cable. (May 30th.)

South Africa.—Capetown.—June 25th. Electricity Department. Supply of single-phase transformers. (B.X. 6378.)*

Johannesburg.—June 12th. S.A. Railways and Harbours. 2,000-V switch units and l.p. switchboards. (B.X. 6365.)*

June 19th. Supply and delivery of metal-clad 2,000-V switchboard for sub-station at Bloemfontein workshops. (B.X. 6402.)

July 28th. Twenty-eight electric lifts for the new railway building, Johannesburg. (A.X. 9623.)*

June 26th. Municipal Council. Electricity meters and time switches. (B.X. 6449.)*

Sunderland.—July 7th. Electricity Department. Supply for 12 months ending September 30th, 1931, of cable, wire, meters and lamps. (See this issue.)

Warsop and Blackwell.—June 24th. Rural District Council. Electric motors and equipment in duplicate at main pumping house, Warsop (contract No. 4); electric mains and equipment in duplicate at booster station (contract No. 7). Specifications (deposit £2 2s. each contract) from Elliott and Westwick, Gilcroft Chambers, Church Lane, Mansfield.

Wolverhampton.—June 17th. West Midlands Joint Electricity Authority. Double circuit 33,000-V overhead transmission line supported by steel towers. (May 30th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.

Contracts Closed.

Birkenhead.—Electricity Committee. Accepted :—
1,000-kVA transformer (£380).—English Electric Co., Ltd.

Birmingham.—Education Committee. Accepted :—
Electric lighting installation at Kelby Close School (£1,479).—Harrison & Searle, Ltd.
Electric lighting installation at Tedbury Crescent School (£1,323).—Ellis & Ward, Ltd.

Bradford.—Electricity Committee. Accepted :—
Supply, deliver, and erection of two 710-kW mercury arc rectifiers, with necessary switchgear, at Four Lane Ends and Dudley Hill sub-stations.—Bruce Peebles and Co., Ltd.
New interior stacks for Nos. 1 and 5 cooling towers at Valley Road power station, new distribution for No. 3 cooling tower, &c.—Davenport Engineering Co., Ltd.
Petrol-electric mobile crane at Valley Road station.—Ransomes & Rapier, Ltd.
Tramways Committee. Accepted :—
100 steel tramcar tires (£328).—English Steel Corporation, Ltd.

Brighton.—General Purposes Committee. Accepted :—
Additions to lighting in Grand Junction Road and Madeira Drive (£780).—General Electric Co., Ltd.
Lighting Committee. Accepted :—
Steam air ejector and pump for turbine (£850).—Richardsons, Westgarth & Co., Ltd.

Eastbourne.—Electricity Committee. Accepted :—
Switchgear (£2,381).—General Electric Co., Ltd.

Glasgow.—Finance Committee. Accepted :—
Electrical installation at St. Andrew's Halls (£1,239).—Johnston, Park & Co., Ltd.
Lighting Committee. Recommended :—
Electrical fittings and accessories.—Sloan Electrical Co., Ltd.; British Electrical & Manufacturing Co.; Credenda Conduits Co., Ltd.; Brown & Co.; Paterson & Service; General Electric Co., Ltd.; Wm. McGeoch & Co., Ltd.; Falk, Stadelmann & Co., Ltd.; Siemens Bros. and Co., Ltd.
Electricity Committee. Recommended :—
Switchgear (£5,567).—A. Reyrolle & Co., Ltd.
Transformer (£194).—Bruce Peebles & Co., Ltd.
Housing Committee. Recommended :—
Electrical installation at the Carnwadric housing scheme £3,136).—David Henderson.
Cleansing Committee. Accepted :—
Four electric vehicles (£1,125 each).—Richard Garrett and Sons, Ltd.

Gloucester.—Electricity Supply Committee. Accepted :—
Cable :—Derby Cables, Ltd. (8,000 yds.); Edison Swan Electric Co., Ltd. (1,000 yd.).

Ilford.—Electricity Committee. Recommended :—
Convertor (£1,200), control gear (£1,280), kiosk with switchgear and transformer (£444).—Crompton Parkinson, Ltd.

Lanark.—County Council. Accepted :—
Equipment of new offices (electric lighting).—Johnstone, Park & Co., Glasgow.
Heating and ventilation.—James Combe & Co.
Electric hoist.—A. P. Steven, Ltd.

Leicester.—Hospitals Committee. Accepted :—
Electric lighting at Belgrave pumping station (£432).—Gent, Hurley & Orringe.

London.—L.C.C.—Central Public Health Committee. Wiring and fittings for electric lighting, power, bells, and telephones at Tooting Home :—

ALEX. HAWKINS & SONS (Accepted)	£1,495
A. Dean & Co., Ltd.	1,568
J. Briggs, Ltd.	1,570
Electrical Installations, Ltd.	1,798
Leonard G. Tate & Co., Ltd.	2,075
Smethurst & Co. (London), Ltd.	2,200
H. J. Cash & Co., Ltd.	2,688

BATTERSEA.—Borough Council. Accepted :—
Pipework for new 30,000-kW turbo-alternator and boilers :
Steam pipes (£4,243).—Babcock & Wilcox, Ltd.
Water pipes (£2,304).—Aiton & Co., Ltd.
Switchgear required for sub-station in connection with h.p. feeder from generating station (£410).—General Electric Co., Ltd.

AIR MINISTRY.—Accepted :—
Automobile type lamps.—Siemens Electric Lamps and Supplies, Ltd.

Manchester.—Town Hall Committee. Accepted :—
Passenger lift at Lord Mayor's apartments.—Etchells, Congden & Muir, Ltd.
Education Committee. Accepted :—
Electrical installation at Openshaw clinic.—Bertram Thomas.
Electrical installation, Gorton special school.—W. A. Shaw and Co.
Waterworks Committee. Accepted :—
Two rotary balancers, switchboard, station wiring, &c., at Haweswater waterworks.—Bertram Thomas.
Electricity Committee. Accepted :—
6,600-V switchgear, Oldham Road sub-station.—A. Reyrolle and Co., Ltd.
420-V switchgear, Barton power station.—Metropolitan-Vickers Electrical Co., Ltd.
The chief engineer and manager has been authorised to exercise the option under contracts with the undermentioned firms for the purchase of such transformers as may be required during the period ending January 9th, 1931 :—Crompton Parkinson, Ltd.; the English Electric Co., Ltd.; Ferranti, Ltd.; and C. A. Parsons & Co., Ltd.

Penistone.—Education Committee. Accepted :—
Installing electric light at Silkstone Common school.—Hinchliffe & Co.

Plymouth.—Tramways Committee. Accepted :—
Crossings.—Titan Trackwork Co., Ltd.
Points with spring mechanism.—Edgar Allen & Co., Ltd.
Rails.—Alex. McBean & Son.

Salford.—Electricity Committee. Recommended :—
Metal-clad switchboard for Frederick Street sub-station (£542).—Ferguson, Pailin, Ltd.

Sheffield.—Baths Committee. Recommended :—
Electric lighting at Wincobank baths (£179).—T. B. & W. Cockayne, Ltd.

Slough.—The Urban Council has accepted the tender of the Harland Engineering Co., Ltd., for two electrically-driven pump sets with motors, cabling equipment, with control switch, distribution box, &c., and air exhauster with motor starter, for the waterworks, at £873.

South Africa.—JOHANNESBURG.—Municipal Council.
Two 1,080-kVA Scott-connected outdoor transformers (£948).—H. Davies & Co., Ltd.
60 miles 19/.083 in. diameter underwriters' wire (£7,200), 15 miles No. 8 s.w.g. ditto (£7,587).—Metropolitan-Vickers Electrical Co., Ltd.
60 miles 19/.052 ditto (£3,015).—British General Electric Co., Ltd.
30 miles No. 6 s.w.g. ditto (£892).—Johnson & Phillips Pty., Ltd.
15 miles No. 8 s.w.g. ditto (£387).—Stratford Engineering, Ltd.
Four 6,600-V metal-clad switch units (£661).—A. Reyrolle and Co., Ltd.
—*South African Engineer.*

Forthcoming Events.

Tramways, Light Railways and Transport Association.—Hastings. June 11th to 13th. Annual congress.

World Power Conference.—Berlin. June 16th to 25th.

Association of Mining Electrical Engineers.—June 24th to 28th. Annual convention in London.

Electrical Contractors' Association.—Llandudno. June 25th to 27th. Annual convention.

Physical Society.—Friday, June 13th. Imperial College of Science, South Kensington, S.W.7. 5 p.m. Short papers and a demonstration.

Royal Institution.—Friday, June 13th. Institution, 21, Albemarle Street, W.1. 9 p.m. "Unemployment." Prof. H. Clay.

Institution of Electrical Engineers (London Students' Section).—August 2nd to 13th. Summer meeting in the Ruhr district (Germany) and Switzerland.

British Association for the Advancement of Science.—Bristol, September 3rd to 10th. Annual meeting.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of makers of the following devices :—

STEBA electric kettle.
J.P. heating tubes (Jackson & Page).
FRANCOLITE hand-painted glass.
CLASSIC electric vapour radiators.

Notes.

Artificial Daylight.

The effect of distribution and colour on the suitability of lighting for clerical work is dealt with in Illumination Research Technical Paper No. 10 issued by the Department of Scientific and Industrial Research (H.M. Stationery Office, price 6d. net). It describes experiments which have been made with the object of obtaining more definite information on the relative merits of natural and artificial lighting systems, and of discovering, if possible, the cause of the opinion so generally expressed in favour of natural lighting. The first stage of the work was carried out at the National Physical Laboratory, where a room was so fitted up that both the distribution and the colour of the light admitted to it under ordinary daylight conditions could be simulated by artificial means, so that the two systems could be readily compared.

These laboratory experiments were followed by full-scale trials carried out by H.M. Office of Works in some clerical offices badly supplied with natural daylight. Systems of lighting suggested as a result of the laboratory work were installed in these rooms, and the occupiers were requested, after the lapse of a reasonable time, to express their opinions as to the suitability of the systems. From the results obtained in the tests under laboratory conditions it was clearly indicated that, for equal illumination intensities, artificial daylight was definitely preferred to light of the colour of that given by a tungsten-filament vacuum lamp. (*a*) An artificial-daylight system was preferred to ordinary tungsten-filament vacuum lamps, and (*b*) a vacuum lamp system with a "semi-indirect" type of distribution was placed last in order of preference. The order of preference among the two types of distribution with artificial daylight and "window" distribution with vacuum lamps was indefinite. In the case of the full-scale trials the results obtained were less in favour of artificial daylight and, except in the case of rooms wherein it was necessary to supplement daylight during considerable periods in the day, no definite preference was expressed for artificial daylight. For "mixed lighting," however, artificial daylight was definitely preferred, and it was found that the most suitable system consisted of diffusing wall-panels and indirect ceiling fittings. It should be emphasised that the experiments described in the report refer only to the lighting of rooms in which clerical work is carried out, and the results should not, therefore, be applied, without further consideration, to other types of work.

Electricity on a Poultry Farm.

Members of the Preston Corporation Electricity Committee recently paid a visit to the electrified poultry farm of Messrs. H. Sutton & Sons, Little Hoole, and were interested in the application of electricity for the hatching of eggs. The Buckeye mammoth incubator, which is one of the principal electrical appliances, is capable of dealing with 16,000 eggs at one time, and the operation of "turning" is accomplished by means of swivel trays. The common fear of poultry farmers is that, in the event of a break in the electricity supply, there might be disastrous results to the eggs. Mr. Sutton informed the visitors that once the supply was interrupted for four hours, in which time there was a loss of only three degrees in the temperature, owing to the insulated doors which prevented the escape of heat. When the current fails or the place becomes overheated, an alarm bell rings. Since the new year 60,000 chickens have been hatched out.

Welding Competition.

In order to afford working welders an opportunity of bringing the results of their practical work to the notice of their fellow members of the welding industry, the Institution of Welding Engineers is offering a prize of ten guineas and its gold medal for the best original paper by a *bonâ fide* operative welder. The competition will close on August 31st. The judges will be Major James Caldwell, nominated by the I.E.E., and Mr. L. St. L. Pendred, president of the Institution of Mechanical Engineers. The winning paper will be read before the Institution.

Arterial Road Lighting.

A plea for the better lighting of arterial roads, which would, he believed, help to reduce the toll of accidents, was made at the recent London congress of the National "Safety First" Association by Mr. Robert Beveridge, a member of the Association of Public Lighting Engineers. Mr. Beveridge said arterial roads were constructed under the artificial stimulation of Government subsidies without regard to illumination, or the cost of maintaining illumination, even if facilities for doing so were available.

The South-West England Scheme.

The Central Electricity Board adopted the South-West England and South Wales Electricity Scheme, 1930, on May 23rd, and have published the scheme as adopted. Copies can be obtained, price 1s. 6d. each (by post 1s. 7d.) from H.M. Stationery Office.

"Durapso" Steel.

A French concern, the Société des Acieries de Pompey, has recently introduced a new steel known as "Durapso," which is claimed to be specially suitable for the construction of electric power transmission-line masts and the structural work of outdoor transformer stations. As compared with mild steel, it is claimed that it is possible to effect a reduction of from 20 to 30 per cent. in the weight of material used for a particular job, while in the case of masts another feature claimed for the new steel is its freedom from rusting and corrosion tendencies, repeated tests having shown it to be "twelve times less attackable" in this respect than ordinary steel.

Television in America.

A television vaudeville act, shown on a screen 6 ft. by 7 ft., is reported to have been added to the regular programme of a theatre at Schenectady, N.Y., U.S.A. Last autumn the largest television picture shown by Dr. Alexanderson, of the General Electric Company, of Schenectady, was 14 in. square, and his first picture in 1927 was only 3 in. square. The audience watching the first demonstration of the new-sized picture could see it clearly from all parts of a house seating 2,000 people. The artists performed their act in Dr. Alexanderson's laboratory a mile from the theatre. Television was combined with radio transmission for the reproduction of the complete talking picture.

Mr. Allen B. Dumont, chief engineer of the De Forest Radio Company, has asked the Federal Radio Commission for a construction permit for a television station at Passaic, N.J., using 20,000 watts power and operating on 2,000-2,100 kilocycles. According to the *T. & T. Age*, he stated that television was "developing very rapidly and no one could tell what would happen within the next six months." His company had joined forces, he said, with the Jenkins Television Corporation, which had spent more than $500,000 on experimental work at Passaic.

London Radio Societies.

On May 17th about 80 members of a number of London radio societies, including those of Muswell Hill, Golders Green, Tottenham, North Middlesex, and City and Guilds, visited the research laboratories of the General Electric Co., Ltd., at North Wembley. The programme commenced with short talks and demonstrations in the electrical laboratory, each given by a member of the research staff specialising in one particular subject, including the comprehensive valve-life test arrangements and a demonstration of practical applications of photo-cells, showing how they can be used for the exceedingly accurate timing of races, and also applied to loud-speaker reproduction of light records on a film. A heterodyne oscillator with a range of frequencies from 50 to 1,000 cycles and of extreme accuracy, used for bridge measurements, was demonstrated and described.

The Electrical Association for Women.

At the May Meeting of the Plymouth and District branch of the Electrical Association for Women Mr. J. W. H. Penrose gave a lecture in praise of domestic refrigeration.

The Electrical Trades Benevolent Institution.

The annual report and accounts of the Electrical Trades Benevolent Institution for the year ended December 31st, 1929, show that the income from the contributions for the year was £9,334, making with the receipts from dividends a total income of £11,040. The result of the year's work has been that an amount of £7,577 has been carried to the capital account, after the payment of relief and expenses. During the year a further £7,000 was invested, bringing the total of the invested funds up to £44,307 at cost. During the year the number of grants made was nearly 400, representing £2,528. In 1926 only 75 grants were made, representing £1,105.

Ultra-violet Rays in the Garden.

The King and Queen recently visited a cellar at Cumberland Lodge, Windsor Great Park, where Viscount and Viscountess FitzAlan have an underground garden. By means of two ultra-violet ray lamps and a floor specially prepared with soil and fertilisers, flowers and fruit are grown to perfection in a remarkably short space of time. Daffodils flower in the second week in January and strawberries ripen by March 12th. The cellar is kept at a moderate temperature, and the flowers and fruit are seldom given more than eight hours a day of the ultra-violet rays.

Appointments Vacant.

Meter records clerk for Hackney Electricity Department.

Assistants at the Science Museum, South Kensington, for the Board of Education.

Principal at Camborne Day Continuation School for the Cornwall Education Committee.

(See our advertisements pages to-day.)

Electricity Generation at French Collieries.

At a recent meeting of the Société Française des Electriciens, an interesting discussion took place on the feasibility and economics of supplying the increasing electricity requirements in the Paris district by power generated at and transmitted from the collieries in the Nord Department of France. M. Rauber considered that electricity generation at the collieries would always be at a disadvantage, owing to the absence of the necessary water for cooling; he estimated that plant to provide the necessary cooling would increase the cost of the installation by at least 5 per cent. Then, again, there was the cost of the transmission lines and transformer stations. In his opinion the cost of a complete installation for generating power at the collieries and transmitting it to Paris would be, other things being equal, at least 25 per cent. more than the cost of a generating station in Paris. A 5 per cent. loss in transmission would also have to be taken into account.

M. Mathivet spoke in favour of electricity generation at collieries, and, while agreeing that the linking up of the various hydro-electric stations in the centre of France was a national necessity, he considered the time would come when the electric supply undertakings in the Paris area would be glad of the assistance which the power stations in the coal mining areas of the Nord would be able to render.

Mines Regulations and Orders.

The Secretary for Mines announces that the 1929 edition of the annual volume of "Regulations and Orders relating to Mines under the Coal Mines Act, 1911" has been published by H.M. Stationery Office (1s. net). The book contains all the Orders (including Regulations) of a general nature relating to mines under the Coal Mines Acts which were in force on January 1st, 1930, and its publication has been slightly delayed in order that it may include also the new General Regulations in regard to First Aid, which came into force on April 1st, 1930. In this edition further improvements have been made in re-arrangement of the matter under subject groups, with the object of enhancing its utility as a book of reference for mine managers and others. The book also contains reference lists of permitted explosives, approved types of safety lamps, safety-lamp glasses and breathing apparatus, and memoranda on the official tests of safety lamps, explosives and rescue apparatus. A list of recent Parliamentary and other official publications relating to the coal mining industry is printed in an appendix.

Oversea Factories for Australia.

In the House of Representatives on May 30th, Mr. Forde, Acting Minister of Customs, stated that oversea manufacturers who were intending to begin production within Australia in consequence of the new tariff included: from the United States, Julius Kayser & Co. (holeproof hosiery), Goodyear Tire and Rubber Company, Heinz Company; from Great Britain, Godfrey Phillips, Limited, Gilbey, Limited; Swedish Match Company; Philips Lamps (for the manufacture of radio receivers and parts); Bosch Aktien-Gesellschaft. In addition the Australian General Electric Company is taking up the manufacture of filament lamps.

Corona-resistent Cable.

In an attempt to comply with the unusual requirements of neon signs a special cable has been introduced by the General Electric Co., of New York. It is made up of a No. 14 A.W.G. stranded copper conductor, insulated with a high-grade 45 per cent. compound over which is applied a reinforcing cotton braid, which, in turn, is covered with a layer of ozone-proof corona-resistent material capable of warding off any detrimental effects to the rubber insulation. This entire assembly is further protected by close cotton braid and layers of impregnating and finishing flame-proof compound, which serve as a protection against moisture, heat, cold, and flame. A final coating of lacquer is applied for additional protection and as a lubricant to ease the installation of the cable in conduit. The cable has a maximum overall diameter of one-half inch, so that it is satisfactory for practically all present signs. In the underwriters' laboratory puncture test a sample of the cable was raised to 50,000 volts and held for one minute. In the extended voltage test, in which a coiled sample must withstand 30,000 volts between conductor and mandrel for one hour, the sample was held for 120 hours, and the voltage was then raised until failure occurred at 68,000 volts. In the moisture-absorption test a sample immersed for 24 hours absorbed only 0.56 per cent. by weight, whereas the permissible absorption is 10 per cent. The drip and flame tests similarly gave satisfactory results. The new cable can be used, not only for neon signs, but also wherever a small-diameter, corona-proof, high-voltage conductor is required.

The Hydro-electric Resources of Canada.

The Dominion Water Power and Reclamation Service of the Department of the Interior, Canada, has recently issued the annual report of its activities for the fiscal year ended March 31st, 1928. With the installation during the year of new hydro-electric equipment of more than 221,000 h.p., there was at the end of the period under review a total of 4,777,921 h.p. installed for all purposes. The most recent figures of the available water-power resources of the Dominion estimate the total to be 20,197,000 h.p. under conditions of ordinary minimum flow, or 33,113,000 h.p. ordinarily available for six months of the year. These estimates are, however, considered conservative, since an analysis of the water-power plant, concerning which complete data are available as to turbine installation, and satisfactory information as to stream flow, gives an average machine installation of 30 per cent. greater than the ordinary six-month flow of power. Among the large installations during the year, the most outstanding were those of the Gatineau Power Co. on the Gatineau River, Quebec, where two installations having initial capacities of 102,000 h.p. and 72,000 h.p. were brought into operation. Other installations of note were those of the British Columbia Electric Railway Co. on Stave Lake, with 12,500 h.p., the Manitoba Power Co., with an addition of 28,000 h.p. at Great Falls, on the Winnipeg River, the Ontario and Minnesota Power Co., with two new stations on the Seine River of 10,000 h.p. and 14,420 h.p., respectively, and the Sandy Lake development of the Nova Scotia Power Commission, with 5,000 h.p. installed. Of Canada's total hydro-electric installation, 3,904,678 h.p. was installed for domestic, municipal, and commercial lighting and power purposes; 528,731 h.p. in pulp and paper mills; and 344,512 h.p. for other industrial uses such as saw-mills, machine shops, pumping plants, &c. Territorially the developed water-power was divided up as follows:—British Columbia, 473,142 h.p.; Alberta, 34,107 h.p.; Saskatchewan, 35 h.p.; Manitoba, 255,125 h.p.; Ontario, 1,816,908 h.p.; Quebec, 2,064,723 h.p.; New Brunswick, 47,231 h.p.; Nova Scotia, 71,017 h.p.; Prince Edward Island, 2,434 h.p.; Yukon and North-West Territories, 13,199 h.p. The capital invested in the water-power industry in Canada was estimated to be $875,000,000, which is more than that for any other single manufacturing industry in the country.

The Scottish Grid.

Referring to the article on "The Scottish Grid" which appeared in our issue of May 23rd, p. 947, we are asked to state that the English Electric Co., Ltd., supplied a number of large transformers for various sub-stations in connection with the scheme.

Educational.

WHITWORTH SCHOLARSHIPS.—Revised regulations for the award of Whitworth scholarships in engineering have been issued by the Board of Education. The awards offered for competition in 1931 are two senior scholarships of the value of £250 a year for two years, six of the value of £150 a year, which may be increased by the Board, having regard to the funds available, the expenses of the course and the needs of the scholar, and up to 25 prizes of £10 each for unsuccessful competitors for Whitworth scholarships whose work at the examination appears to deserve recognition. The regulations are published by the Stationery Office, price 3d.

Short courses of evening lectures and laboratory work will be given in engineering and allied subjects during the summer at the Manchester Municipal College of Technology. The classes will begin on June 16th and 17th, and intending students should present themselves for enrolment half-an-hour before the first meeting of the classes they wish to attend.

Mining Electrical Engineers.

The annual general meeting of the South Wales branch of the Association of Mining Electrical Engineers was held at Porthcawl on May 17th, Mr. W. W. Hannah presiding. In this annual report, the honorary secretary, Mr. H. J. Norton, said that the branch was still the largest in the country, the total membership being 387. The gold medal awarded by the Association for the best paper had again gone to South Wales, being secured by Mr. S. B. Haslam (Cardiff) for his paper on "Modern Methods of Firing Steam Boilers, with Special Reference to Pulverised Fuel." The branch prize for the best paper was awarded to Mr. F. E. Pring (Varteg) for his paper on "Electric Coal Cutters in Low Seams." The ballot for four Council members resulted in favour of Messrs. S. Dwyer (Cardiff), J. Jones (Abertillery), R. E. Michael (Crumlin), and H. Williams (Rhondda), while the branch officials for the coming year will be:—*Branch president*: Sir A. Whitten Brown, K.B.E.; *vice-presidents*: Major W. Roberts (Cardiff) and Mr. H. W. Shilbach (Maesteg); *hon. treasurer*: Mr. A. C. MacWhirter (Cardiff); *hon. secretary*: Mr. H. J. Norton (Cardiff); *hon. secretary* (Western sub-branch): Mr. T. B. Stanawaf (Swansea).

Association of Consulting Engineers.

The accounts of the Association of Consulting Engineers (Inc.) for the year ended April 30th, 1930, show that the expenditure for the year was £520, and the income £596. The membership of the Association was 122 at the end of the year.

Swedish Activities in Poland.

The A.B. Elektro-Invest, which was recently formed by the Allmänna Svenska Elektriska A.B., and the Stockholm Enskilda Bank, is reported to have taken over the working of the municipal electricity works at Wloclawek, Poland, the agreement having already been sanctioned by the Polish Government. The object of the company is to acquire and carry on electrical concessions and thus secure orders for the A.S.E.A. Transactions similar to the above are said to have already been effected in other parts of Poland, Jugo-Slavia, and Germany.

Institution of Electrical Engineers.

LONDON STUDENTS' SECTION.—The Committee's report for the 1929-30 session shows that the number of students and graduates under 28 in the section is now 1,535, an increase of 228 since last session; in numbers it is partly due to the new conditions whereby graduates between the ages of 26 and 28 have the privileges of students, but apart from this, the number of new students joining the Institution has been about the same as in previous years. Some 11 meetings were held during the session, the average attendance being 112 members and visitors, an increase of 63 per cent., and members of the section have also attended joint meetings with the other Institutions. Some 13 visits were paid to works, and a dinner, a dance, and a smoking concert were held during the past session; all were well attended, except the dinner. The summer meeting was held from August 3rd to 14th, and consisted of a tour through Northern France and a stay of five days in Paris; 26 students from London and the provinces took part. The Council has agreed to the publication of a *Students' Journal*, dealing mainly with the happenings in the Students' Sections, and to be supplied to all students and graduates under 28 in addition to the existing I.E.E. *Journal*. The Committee is considering a system of district representation, as it is felt that a large number of members have no adequate representation on the Committee.

SCHOLARSHIPS IN ELECTRICAL ENGINEERING.—The Council of the Institution has established the following scholarships, the first awards of which will be made this year:—

Duddell Scholarship, of the annual value of £150 and tenable for three years. Each candidate must be nominated (not later than June 15th, 1930) by a corporate member of the Institution; preference will be given to candidates whose fathers, or near relatives, are, or have been, members of the Institution. The award is open to British subjects under 19 years of age on July 1st, 1930, who have passed the matriculation examination of a British University, or an examination exempting from matriculation, and who wish to take up a whole-time day course in electrical engineering.

Ferranti Scholarship, of the annual value of £250 and tenable for two years. Each candidate must be nominated (not later than August 15th, 1930) by the professor, or teacher, under whom he is working, or has worked; preference will be given to candidates whose fathers are, or have been, members of the Institution. The award is open to British subjects under 26 years of age on July 1st, 1930, who are students or graduates of the Institution and have been such for not less than two years, have completed to the satisfaction of the Council a recognised electrical engineering course of at least three years and desire to carry out whole-time research or post-graduate work.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

The King's Birthday Honours.—The list of honours conferred by the King on the occasion of his 65th birthday (on Tuesday last) included the names of the following gentlemen to whom we extend our congratulations:—Mr. F. H. ROYCE, O.B.E., M.I.E.E., founder of Rolls Royce, Ltd., and a director of Royce, Ltd., and Mr. BASIL MOTT, past-president of the Institution of Civil Engineers, receive baronetcies; Mr. F. W. GOODENOUGH, C.B.E., of the Gas, Light and Coke Co., chairman of the Government Committee on Education for Salesmanship, is knighted; Mr. H. WRIGHT, chairman of the Executive Committee of the Imperial College of Science and Technology, also receives a knighthood; Sir WILLIAM H. CLARKE, C.M.G., High Commissioner in Canada, is promoted to K.C.M.G.; Col. FREDERICK PALMER (of Messrs. Rendel, Palmer and Tritton), is also made a K.C.M.G.; the O.B.E. is conferred upon Mr. J. A. B. HORSLEY, M.I.E.E., Electrical Inspector of Mines, and Mr. W. J. MEDLYN, M.I.E.E., Superintending Engineer, G.P.O.; and Mr. G. R. DAIN, M.C., manager of the Calcutta Tramways Co., Ltd., is given the C.I.E.

Mr. W. J. Medlyn, whose name appears in the above list, has just retired from the position of Superintending Engineer of the South Lancashire District, after over forty years' service. The district includes both Manchester and Liverpool, and for the past seventeen years Mr. Medlyn has been in control of the provision, development and execution of the works involved in the continuous extension of telegraph and telephone services. In 1926-27 he was chairman of the North-Western Centre of the I.E.E. He has also served as chairman of the Institution of Post Office Electrical Engineers. The staff of the district assembled, to the number of over 400, on May 31st, which was the last day of Mr. Medlyn's service, in order to make presentations as tokens of personal appreciation.

Mr. T. E. Herbert, M.I.E.E., the present chairman of the North-Western Centre of the I.E.E., has succeeded Mr. Medlyn as Superintending Engineer of the District.

Mr. H. C. Hazel, M.I.E.E., of Messrs. Lindsay & Co., Liverpool, has been nominated as next president of the Electrical Contractors' Association.

Mr. W. R. Rawlings, A.M.I.E.E., who was the Association's first president and served again in 1913-14, has been nominated as vice-president for the year 1930-31.

Mr. F. O. Harber, A.M.I.E.E., A.Amer.I.E.E., was married last Tuesday to Miss Dorothy E. Morgan, of Urmston, at the Parish Church, Urmston.

Mr. T. H. U. Aldridge, late vice-president and general manager of the Shanghai municipal electricity undertaking and the Shanghai Power Company, has recently arrived in this country, where he expects to reside permanently with headquarters in London.

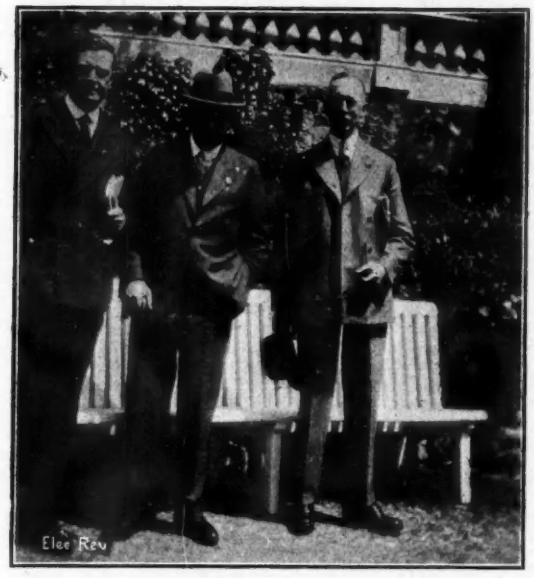
Mr. W. N. C. Clinch, whose appointment as electrical engineer and manager of the Brighton Corporation electricity undertaking was confirmed by the Council on May 29th, is at present superintendent of power stations to the North Metropolitan Electric Power Supply Co., an appointment which he has held since January, 1927. In this capacity he is responsible to the chief engineer, Capt. J. M. Donaldson, for the control of the company's main transmission system and power

Mr. W. N. C. Clinch,
The New Chief of the Brighton Undertaking.

stations of some 108,000-kW capacity. This work covers not only operation but also the layout and construction of new power-station plant. Mr. Clinch has had long experience in connection with powdered-fuel installations, and he was associated with the construction and putting into operation of the new Brimsdown power station. He has filled various positions with the North Metropolitan Company, and is keenly interested in the utilisation of electrical energy for all purposes. He was elected an associate member of the I.E.E. in 1921.

Mr. Fred. T. Jackson, managing director of the Telephone Manufacturing Co., Ltd., spoke on the telephone to the Melbourne office of the company's Australian associate (New System Telephones (Pty.) Ltd.) early on June 2nd. The conversation lasted for about five minutes, and was entirely satisfactory, a number of matters being dealt with that, in the ordinary way, would have necessitated several cablegrams.

On May 28th the staff of the Braintree branch of the East Anglian Electric Supply Co., Ltd., presented **Mr. C. V. Davies,** sales engineer, with a mahogany clock upon his leaving the company to take up a position with the Northampton Electric Light & Power Co., Ltd.



Mr. F. Forrest, Ald. Burman and Mr. E. J. Jennings.

Birmingham Personalities at the I.M.E.A. Convention.

Among the awards made by the Institution of Civil Engineers for papers read during the 1929-30 session are a Watt gold medal to **Mr. A. E. L. Chorlton,** C.B.E., and a Telford premium to **Professor E. G. Coker,** D.Sc., F.R.S.

Mr. Thomas Roles, Bradford city electrical engineer, has been authorised by his Committee to attend the meeting of the International Electrotechnical Commission to be held in Sweden in July. Mr. Roles will be one of the delegation from the British Engineering Standards Association and the Incorporated Municipal Electrical Association.

Mr. H. Brotchie, who has been on the staff of the Battersea Electricity Department for 14½ years, has severed his connection with that undertaking, having secured the appointment of power station superintendent at Letchworth Garden City, Herts. On May 28th the staff and employés of the Department presented him with an inscribed gold wrist watch and a radio battery eliminator. In the unavoidable absence of Mr. F. A. Bond, borough electrical engineer, the chief assistant engineer, Mr. H. F. J. Thompson, made the presentation.

Mr. Arnold J. Sidgwick, after seventeen years' service with Messrs. Merz and McLellan, has commenced business on his own account at 18, Oxford Street, Newcastle-upon-Tyne, as an electrical and refrigeration engineer.

The Burnley branch of the Transport Workers' Union has presented a grandmother clock to **Mr. H. Mozley,** who recently retired from the position of general manager of the Corporation tramways and omnibuses.

Mr. Leslie Price, of the General Electric Company, Ltd., Stage Lighting Department, has joined the staff of Venreco, Ltd., stage lighting specialists, as sales engineer, as from June 2nd. Mr. Price was with the General Electric Co. for 19 years.

The Bridgend Urban District Council has increased the salary of its electrical engineer (**Mr. W. Welbury**) from £500 to £572.

Mr. H. B. Sharpe, transport manager to the Rotherham Corporation, who has been appointed to a similar position at Morecambe, has been presented by the transport staff and employés with a gold watch.

At the recent annual meeting of the Ayrshire Electricity Board held at Kilmarnock, ex-Provost MATTHEW SMITH was unanimously reappointed chairman, and Dean of Guild JOHN MCINTYRE was appointed vice-chairman, in the place of Sir Alexander Walker, who had resigned. Bailie DAVID ORR and Police-Judge ANDREW M. HUNTER were re-elected as conveners of the Engineering and Finance Committees respectively.

Obituary.

Mr. James W. Speight, who was managing director and consulting engineer of the Ormskirk Electric Supply Co., Ltd., up to the end of last year, died last week at the Ormskirk Cottage Hospital. He was 64 years of age. Before going to Ormskirk he was managing director and consulting engineer to the Penrith Electric Supply Co., and was for six years deputy electrical engineer at Blackpool.

Mr. J. Hirst.—The death is reported, at the age of 74, of Mr. James Hirst, who was city electrician of Newcastle, N.S.W., for many years.

Will.—The late Mr. LUDWIG BREITMEYER, chairman of the Lisbon Electric Tramways, Ltd., the Cape Electric Tramways, Ltd., and a number of other concerns left estate valued at £939,843 gross and £901,186 net.

Financial Section.

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares.

New Companies Registered.

J. W. Lewsley, Ltd.—Private company. Registered May 27th. Capital, £2,000 in £1 shares. Objects: To acquire the business of an electrical and cinematograph engineer carried on by J. W. Lewsley at 33, Derby Road, Nottingham. The first directors are: J. W. Lewsley, 34, Johnson Road, Lenton Boulevard, Nottingham, electrical engineer; J. Lewis, 65, Derby Road, Nottingham, licensed victualler (both permanent).

Grosvenor Electric Batteries, Ltd.—Registered as a public company May 29th. Capital, £50,000 in £1 shares. Objects: To acquire the business carried on at Watford and at 2 and 3, White Street, E.C., by the Grosvenor Battery Co., Ltd.; to adopt an agreement with that company and W. G. Adie, E. Goodchild and M. G. Chant; and to carry on the business of manufacturers, importers, exporters and agents for the sale and purchase of and dealers in electrical goods, equipment and accessories, batteries, cells, motors, magnetos and accumulators, electrical, mechanical and general engineers, manufacturers of and dealers in wireless apparatus, &c. The subscribers are: S. J. Sulston, 32, Deal Road S.W.17; H. Rich, 3, Beaulie Gardens, Winchmore Hill, N.21, law clerk; and five others. Registered office: 76, Finsbury Pavement, E.C.2.

Pennington, Stevens & Taylor, Ltd.—Private company. Registered May 29th. Capital, £5,000 in £1 shares. Objects: To acquire the business of an electrical and mechanical engineer, merchant, broker and agent carried on by P. E. Stevens at 17 and 18 Devonshire Square, E.C. The directors are: P. E. Stevens, Trapps Hill, Loughton, Essex; S. A. Taylor, Forest View, Monkham's Lane, Woodford, Essex. Solicitors: Curwen Carter & Evans, 1, Gray's Inn Square, W.C.1.

Louis Holzman, Ltd.—Private company. Registered May 23rd. Capital, £1,000 in £1 shares. Objects: To acquire the business of a radio agent and factor now carried on by L. Holzman at 37, Newman Street, W.1, and to carry on the business of manufacturers, importers and exporters of, and dealers in all kinds of gramophones, &c. The subscribers are: L. Holzman, 11, Lancaster Court, 37, Newman Street, W.1,

merchant; Dorothy E. Palmer, 39, Woodlands Road, Ilford, Essex, book-keeper. Registered office: 37, Newman Street, W.1.

Electrically Welded Products, Ltd.—Private company. Registered May 26th. Capital, £100 in £1 shares. Objects: To carry on the business of welders of metals of all kinds, manufacturers of and dealers in electric resistance and acetylene welding machines, &c. The subscribers (each with one share) are: A. Round and O. F. Gloster, 21, Waterloo Street, Birmingham. Solicitors: Restall, Round & Gloster, 21, Waterloo Street, Birmingham.

Burgoyne Wireless (1930), Ltd.—Private company. Registered May 24th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of, and wholesale and retail dealers in electric accumulators and batteries, wireless aerials, receivers, cabinets, dials, condensers, headphones, &c. The directors are: A. Lee, 17, Westbere Road, Cricklewood, N.W.; S. Gootnick, 54, Church Street, Stoke Newington, N. Registered office: 34a, York Road, King's Cross, N.1.

Official Returns of Electrical Companies.

Electrical Power Fitting Co., Ltd.—Capital £500 in £1 shares. Return dated April 26th, 1930. 305 shares taken up. £218 3s. 10d. paid. £86 16s. 2d. calls unpaid. Mortgages and charges, nil.

Vac-Tric, Ltd.—Capital, £4,000 in 202 "A" shares of 10s. and 3,899 "B" shares of £1 each. Return dated December 31st, 1929. 202 "A" and 1,903 "B" shares taken up. £2,004 paid. Mortgages and charges, nil.

Woodfyt Sales, Ltd.—Capital, £2,550 in 1,000 preference and 1,500 ordinary shares of £1 each. Return dated November 15th, 1929. 205 ordinary and 638 preference shares taken up. £843 paid. Mortgages and charges, nil.

Park Bros., Ltd.—Capital, £6,000 in 3,000 preference and 3,000 ordinary shares of £1 each. Return dated July 16th, 1929 (filed March 13th, 1930). 1,215 preference and 2,581 ordinary shares taken up. £3,796 paid. Mortgages and charges nil.

Oldham Electrical Contractors, Ltd.—Capital, 1,000 in £1 shares. Return dated June 11th, 1929 (filed April 11th 1930). 503 shares taken up. £203 paid. £300 considered as paid. Mortgages and charges, nil.

English Electric Co,, Ltd.—Satisfaction (1) to the extent of £45,200 on February 20th, 1930, of sinking fund first mortgage debentures secured by trust deed dated September 15th, 1919, and registered October 3rd, 1919, and (2) to the extent of £41,756 of convertible debenture stock secured by trust deed dated August 14th, 1923, and registered August 1st 1924. (According to the register of mortgages, the trust deeds registered on October 3rd, 1919, and August 1st, 1924, originally secured £1,000,000 and £1,600,000).

Central Wireless Co., Ltd.—Particulars filed of £300 debentures authorised by resolutions of May 1st and 2nd, 1930, charged on the company's undertaking and property, present and future including uncalled capital, the amount of the present issue being £100.

Associated Wireless Co,, Ltd.—Two debentures dated May 1st and 16th, 1930, to secure £200 and £150 respectively, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. U. Bolsom, Ulman Lodge, Bridge Lane, Golders Green, N.W.

Solaflex (1930), Ltd.—Particulars filed of £5,400 debentures authorised May 22nd, 1930, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £100.

Tungsten Manufacturing Co., Ltd.—Issue on May 7th, 1930, of £1,800 debentures, part of a series already registered.

A.F.M. Electrical Service, Ltd.—Particulars filed of £500 debentures authorised April 28th, 1930, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £200.

Nelson Electric Co., Ltd.—G. H. Robinson, 95a, Chancery Lane, W.C.2, was appointed receiver on May 19th, 1930, under powers contained in debentures dated April 20th, 1926, and a second debenture dated July 16th, 1926.

Moreland Electric Welding Co., Ltd.—Capital, £4,000 in £1 shares. Return dated September 3rd, 1929 (filed March 29th, 1930). 2,302 shares taken up. £2,202 paid. £100 calls unpaid. Mortgages and charges, nil.

Helsby Cables, Ltd.—Capital, £2 in £1 shares. Return dated April 4th, 1930. Two shares taken up. £2 paid. Mortgages and charges, nil.

City Electrical Appliances, Ltd.—Capital, £5,000 in £1 shares. Return dated July 9th, 1929 (filed May 8th, 1930). 2,187 shares taken up. £2,160 15s. paid, leaving £26 5s. calls unpaid. Mortgages and charges, nil.

Gayton Park Electricity Co., Ltd.—Capital, £3,000 in £1 shares. Return dated July 9th, 1929 (filed May 8th, 1930). All shares taken up. £3,000 considered as paid. Mortgages and charges, nil.

City Notes.

Chloride Electrical Storage Co., Ltd.

The annual meeting of this company was held on June 2nd. Mr. W. S. Naylor (chairman), in presenting the report and accounts (ELEC. REV., May 30th, p. 1040), referred with regret to the death of Mr. W. Bannister, the late chairman. Turning to the progress made during the year under review, the chairman said he was able to report a continuance of development and prosperity, and, as a consequence of additional business, the profits showed a satisfactory increase. The value of investments in subsidiary companies had increased. This was due to a further expansion of the company's interests in the battery industry and to some adjustments following on the reorganisation of the company's existing interests. These extensions had involved a certain increase in the company's "B" ordinary shares. They had sales depôts in London, Bristol, Birmingham, Manchester, Glasgow, Dublin, and Belfast, which supplied the trade, and from 500 to 600 "Exide" service agents. Abroad the sales organisation was widespread, and they had representatives and offices throughout the British Empire, and were obtaining important business in the highly protected Continental countries. For emergency lighting in kinemas and hospitals, they had designed and patented the "Keepalite" system. This apparatus automatically switched on emergency lamps if the regular lighting was interrupted. The works were up to date and equipped with efficient machinery. The conditions under which employés worked were good, and since the appointment of a doctor in 1927 to study to the problem of the prevention of lead poisoning, there had been no case of this description. The battery business seemed to be always in a state of change. In recent times it looked as if the stationary battery business was doomed by reason of the spread of the use of a.c. and the proposed electrical transmission to every remote village. This development introduced new risks of interruption of the supply, and it was obvious that these risks opened out a new field for the stand-by or emergency battery on the premises of the actual user of electricity. It seemed natural to suppose that wireless sets in the near future would be operated by taking the current required from the supply mains, instead of from a storage battery. So far they had not suffered from the development of the mains set. The wireless business was still one of their principal lines, and they were doing increasing business in batteries for portable wireless sets.

Electric Furnace Co., Ltd.

The annual meeting of this company was held on May 30th, Mr. D. F. Campbell (chairman) presiding. In presenting the report and accounts (ELECTRICAL REVIEW, May 30th, p. 1040) the chairman said the year had been one of great activity for the subsidiary company (Electric Resistance Furnace Co., Ltd.), and the scope of its operations was extending very rapidly. Among other contracts completed during the year, resistance furnaces had been built for motor car and chemical manufacturers, glass and pottery works had been equipped, and annealing furnaces supplied for gold and aluminium. The increase in interest in electric heat treatment was shown by the following figures of inquiries for resistance furnaces with which they had dealt. If 100 was taken as an arbitrary figure to represent the number in the year ending March 31st, 1927, the corresponding number in 1929/30 was 654, and for the first two months of the current financial year it was at the rate of 1,735 per annum. As to the main business of their company—melting furnaces—the year had been satisfactory, when the general depression in the heavy industries was taken into consideration. Rationalisation had handicapped them. Unfortunately, one of the first effects of an amalgamation of a number of works was a suspension of orders for equipment until the new combination had settled down. Their business was essentially dependent on firms being in a position to modernise their equipment. The maintenance of their foreign connection, especially in France, had been an important factor in their work, and they were continuing to send British machinery abroad, often in spite of heavy tariffs. Technical progress had been well maintained, and during the year they had either completed or had designed and started to manufacture the largest furnaces in the world for melting brass by induction and steel by high frequency methods.

Shanghai Electric Construction Co., Ltd.

The annual meeting of this company was held on May 28th, Mr. J. S. Haskell (chairman) presiding. In presenting the report and accounts (ELECTRICAL REVIEW, May 23rd) the chairman said that they showed a satisfactory financial position, and it had been possible to increase the reserve for renewals to £96,000 and the general reserve to £62,000. During recent years additions to renewals account had been substantially in excess of expenditure under that head, and they hoped

that this would continue to be the case for several years to come so that provision was accumulated for the large outlay which would become necessary when the second general renewal of the rails fell due. The number of passengers carried increased from 123,000,000 to 137,000,000 although the fleet of cars was only increased during the year from 285 to 289. The receipts showed an increase of nearly 60 per cent., as compared with the preceding year. The fall in the value of silver rendered it necessary for them to apply to the Municipal Council for permission to revise the scale of fares, and a new scale was put into operation on April 20th with results which promised to be satisfactory, but the fulfilment of that promise was cut short by a strike which broke out five days later and resulted in the immediate total cessation of traffic on the system. Normal services were resumed on May 17th. The report and accounts were adopted.

Yorkshire (Woollen District) Electric Tramways, Ltd.

Presiding at the annual meeting on May 26th, Mr. W. S. Wreathall (deputy-chairman) said that there had been a very satisfactory increase in the gross traffic receipts, which were £312,400, as compared with £267,650 for the previous year. There were two reasons why the profit had not grown correspondingly with the increase in the traffic receipts. In the first place, the receipts on the tramway were not as good as they had been in the previous year, and in the second place, although the receipts on the omnibuses had gone up considerably, they had had to run more miles in order to take the same money. He did not regard the result of the year's working as being at all unsatisfactory. The London Midland and Scottish and the London & North-Eastern Railway Companies had acquired a joint interest in the company equal to that of the British Electric Traction Co., Ltd., which had previously held a very large proportion of the shares. Following the acquisition of that financial interest, the railways had entered into a working agreement for the co-ordination of railway and road interests in the area served by the company. The report and accounts were adopted.

Compania Hispaño-Americana de Electricidad.

Presiding at the annual meeting in Madrid on May 20th, Sr. Don Juan Ventesa (vice-president) said that the increase in consumption of electricity in the city of Buenos Aires and the favourable development in the province of the same name induced them some time ago to concentrate in this zone the activities of the various undertakings (known as the "Chade") controlled by them. As the result of the acquisition from time to time of various power companies, the zone served by the Chade, apart from the Federal capital, had increased from 1,577 sq. km. in 1920 to 12,497 sq. km. in 1929. The consumption of electricity during the year reached the figure of 625,559,198 kWh, an increase of 15.2 per cent. as compared with the preceding year. The directors had decided to purchase a 52,500-kW generating set for installation at the super power station of Buenos Aires. The report and accounts were adopted.

Cammell, Laird & Co., Ltd.

The directors have now drawn up a new scheme for dealing with the company's debentures in the place of that which recently failed to secure the approval of all classes of holders. They propose that half of the 4½ per cent. debenture stock shall be redeemed on the due date. The period of the other half will be extended for five years, the interest will be raised to 5 per cent., and the repayment price will be 110 per cent., unless redeemed earlier, when the rate will be lower. As before, the holders of the 5 per cent. first mortgage debentures will be asked to sanction an extension of five years and the interest will be raised to 5½ per cent. In addition, the redemption price will be raised to 110 per cent. (instead of 103). The repayment rate of the 5 per cent. debenture stock is also to be increased to 110 per cent., unless it is redeemed earlier, when the rate will be lower.

South Staffordshire Tramways (Lessee) Co., Ltd.

The share of net traffic receipts under working agreements and other revenue for the year, including the dividend received from the South Staffordshire Tramways Co., amounted to £7,427. After deducting payments to local authorities, fees, interest, and taxes, amounting to £4,998, there remains £2,429, which, added to £1,790 brought forward, makes £4,219. Of this £2,500 is placed to reserve and £1,719 is carried forward. During the year the tramway from Great Bridge to Burnt Tree was sold to West Bromwich Corporation, and the Dudley to Wednesbury tramway has been abandoned. Negotiations have been concluded for the sale of the remaining tramways operated by the company.

Electric Construction Co., Ltd.

This company's financial results for 1929-30 were given in our last issue (p. 1041). The report states that although the turnover improved and the profit was higher, business was still adversely affected by the continued trade depression and acute competition. Mr. P. E. Beachcroft resigned from the board during the year. Mr. James Gray has been appointed chairman and will continue to act as managing director. Mr. G. W. Spencer Hawes, M.I.E.E., has been appointed to the board. The meeting was to be held yesterday (Thursday).

Dudley, Stourbridge & District Electric Traction Co., Ltd.

The accounts for 1929 show a working loss of £5,410 on the operation of the tramways. After crediting contributions received under the pooling arrangement and adding £303 brought forward, and charging all expenses, &c., there is a debit balance of £6,009 to be carried forward. The lease of the company's tramways and light railways in Dudley has been surrendered and the whole system of lines operated by the company was discontinued on March 1st, 1930.

Altrincham Electric Supply, Ltd.

The accounts for the year ended December 31st last show a profit of £28,120, as compared with £31,757 in the preceding year. Assessments for the local rates increased from £3,500 to £10,000, and a reduction in the domestic lighting charges has been made. £2,000 is brought forward, making £30,121 available. The directors recommend a final dividend of 2 per cent. on the ordinary shares, leaving £2,236 to be carried forward.

Cape Electric Tramways, Ltd.

In accordance with the special resolution passed at the ordinary general meeting in December last, authorising the transfer of the management and control of the company to South Africa, the board decided that this should take place on May 28th. The head office of the company will in the future be at 24, Wale Street, Cape Town. The registered office of the company will remain at 4, London Wall Buildings, E.C.2, where the registration of transfers will be continued.

Mansfield & District Tramways, Ltd.

The profit for 1929, including £3,366 brought forward, was £8,283. After deducting debenture interest, &c., a balance of £1,189 is carried forward. A bill promoted in the last session of Parliament was finally enacted in a form which gives the company a measure of protection against increased competition, conditional upon the substitution of railless cars for the existing light railways within two years from the passing of the Act.

Dundee, Broughty Ferry & District Tramways Co., Ltd.

The profit for the year ended December 31st last, including £1,169 brought forward, was £2,504, and after deducting debenture interest, £1,388 is carried forward. During the year a Provisional Order was obtained, which provided for a joint service of omnibuses by the company and Dundee Corporation to supplement the tramway service.

Brazilian Traction, Light & Power Co.

The gross earnings of subsidiaries for the year ended December 31st last amounted to $49,351,215, as against $42,774,813 in the preceding year. After deducting total charges there was a balance of $17,184,634, to which is added interest on investments, &c., making a total of $17,605,179, being the gross revenue of the parent company. After meeting expenses and amortisation, the net balance was $16,861,096, as compared with $14,121,604.

Liskeard Gas & Electricity Co., Ltd.

At the half-yearly meeting on May 26th, a resolution was passed assenting to the disposal of the undertaking to Edmundson's Electricity Corporation, Ltd. It was stated that the offer made was to purchase the £1 ordinary shares at 35s. each and the seven per cent. preference shares at 27s. each, the Corporation also accepting responsibility for debentures amounting to £8,000 and agreeing to pay off loans of £2,450.

Lewes & District Electric Supply Co.

The net revenue for 1929 was £12,487, and after deducting expenses and debenture interest, and adding £2,735 brought forward, there is a balance available of £9,952. General reserve receives £4,500, and it is proposed to pay a dividend of 8 per cent. on the ordinary shares, leaving £2,452 to be carried forward. During the year 1,250 preference shares of £10 each were converted into ordinary shares.

Aeonic Radio, Ltd.

The proposals for the reconstruction of the company, mentioned in our last issue, will be placed before the shareholders after the annual meeting on June 16th. It is proposed that the company shall go into voluntary liquidation with Mr. O. Berry, 1, Queen Victoria Street, E.C.4, as liquidator, and that a new company shall be registered under the title "Electrical and Radio Products, Ltd."

Anchor Cable Co., Ltd.

The report for the year ended December 31st last shows a profit of £77,126, as compared with £84,974. To this is added £147,560, and after deducting debenture interest, &c., there is £220,436 available. It is proposed to transfer £10,000 to reserve for income tax, and to pay a final dividend of 15 per cent., making 20 per cent. for the year (as for 1928), leaving £171,436 to be carried forward.

British & International Utilities, Ltd.

We are informed that this is a private investment and holding company which has been organised with an initial capital of £250,000 to acquire interests in leading electrical and public utility undertakings in the United Kingdom and the British Empire. The company has been registered in London by Messrs. Dawnay, Day & Co., Ltd., and the Compagnie Italo-Belge pour Entreprises d'Electricité et d'Utilité Publique S.A., the Belgium subsidiary of the Società Adriatica di Elettricita, of Venice. Count Volpi, president of the Adriatica Company, is chairman, and the directors include Lord Barnby, director of Lloyds Bank and a member of the Central Electricity Board. The company will be associated with two important Canadian concerns and other European companies.

Richard Johnson & Nephew, Ltd.

The annual meeting was held on May 29th. Lt.-Col. Sir Walter Campbell, who presided, in presenting the report and accounts (Electrical Review, May 23rd, p. 969) referred with regret to the death of the late chairman, Major E. Johnson. Turning to the past year's trading he said that they had obtained a share of the work initiated by the Central Electricity Board. Trade with the Dominions had been considerably restricted mainly owing to their reduced purchasing power and the financial crisis prevailing in Australia. He regretted there had been so much unemployment in their business during the past year, but it was inevitable unless they were given the right to supply the requirements of the home market with home-made goods. The report and accounts were adopted.

Birmingham & District Investment Trust, Ltd.

Presiding at the annual meeting on May 27th, Mr. P. M. Rossdale, chairman, said that with regard to their subsidiary tramway companies, the policy of disposing of the tramway assets of these companies was now reaching its final stage, and he hoped next year to be able to state that these concerns had been liquidated.

Foots Cray Electricity Supply Co., Ltd.

The profit for 1929 was £4,042. It is proposed to pay a dividend of 10 per cent. and to carry forward £1,147.

Colne Valley Electric Supply Co., Ltd.

The accounts for 1929 show a profit of £29,211. A dividend of 12 per cent. is paid (as for 1928) and £2,600 is carried forward.

Northwood Electric Light & Power Co., Ltd.

The profit for 1929 was £13,848. A dividend of 15 per cent. is paid on the ordinary shares and £3,616 is carried forward.

Canadian General Electric Co., Ltd.

A dividend of 75 cents per share has been declared on the common stock for the quarter ending June 30th, 1930.

British Columbia Power Corporation.

A dividend of 50 cents per share has been declared on class "A" shares of no par value for the period ending June 30th.

Pennsylvania Water & Power Co.

A dividend has been declared on the common shares of $\$\frac{1}{4}$ per share for the quarter ending June 30th, 1930.

French Companies.

The *Compagnie Générale d'Electricité*, Paris, which extended its investments and participations in 1929, reports an increase in the net profits from 20.99 million fr. in 1928 to 27.61 millions last year. The dividend is maintained at 17 per cent. on the higher capital of 130 million fr.

The *Compagnie des Lampes* reports gross profits of 28,500,000 fr. for 1929, as against 23,604,000 fr. in the previous year. The dividend is 80 fr. per share as compared with 70 fr. in 1928.

The *Compagnie des Forges et Ateliers de Constructions Electriques de Jeumont* reports that the orders received in 1929 exceeded those of the previous year. The dividend is raised from 32.50 fr. per share to 37.50 fr. The net profit was 17,724,000 fr.

German Companies.

The *Voigt and Haeffner Co.* reports a decrease in net profit from 876,000 marks in 1928 to 617,000 marks for the past year, and the dividend is reduced from 9 per cent. to 6 per cent.

The *Mix and Genest Co.*, Berlin, reports that the turnover in 1929 increased by 10 per cent. and was greater than at any time in the fifty years' history of the company. The net profits amount to 1.44 million marks, against 1.15 million marks in 1928, and the dividend remains at 8 per cent.

Swedish Company.

The directors of the *L.M. Ericsson Telephone Company* propose to increase the capital of the company from the present amount of £3,360,000 to £5,600,000 by issuing 806,650 new "B" shares at the rate of 110 per cent., or 55 kronor. The premium on the issue (£230,000) will be transferred to the reserve fund. Holders of old shares are entitled to take up two new "B" shares for every three old ones.

Stocks and Shares.

Tuesday Evening.

The first half of the current year is drawing to its conclusion in so uninteresting a manner as to suggest that each week which passes is the quietest the Stock Exchange has experienced during the current twelvemonth. At this particular period there is, of course, justification for market quietude, owing to the incidence of the Whitsun holidays, the Epsom week, and the prospect of Ascot immediately afterwards. Stock Exchange men will frankly admit, however, that even if these hindrances had not been present, the course of business would probably have been no less sluggish than it is now, for the public are doing little. The only market in which anything approaching active interest continues is that for gilt-edged securities and for other stocks whose prices are dominated more or less by conditions which prevail in Lombard Street.

"Money" Stocks.

The Central Electricity Board 5 per cent. 1950-70 stock has at length risen to 100. Stock is offered at that price or a shade higher, and, as mentioned here on previous occasions, a full half-year's interest becomes payable on September 1st. As the present Stock Exchange Settlement runs for twenty-one days, terminating on June 26th, this scrip carries virtually four months' interest in its quotation. West Midlands Joint Electricity Authority 5 per cent. stock, 1948-68, is still on offer at 99½, free of stamp and fee, carrying April and October interest, and the North-West Midlands Joint Electricity Authority 5 per cent. 1950-70 scrip can be bought at 99, which price includes the interest of 35s. per cent. due on the first of next month. North Metropolitan Electric Power 5½ per cent. debenture, also carrying a broken amount of interest due on July 1st, stands at 105½. There is still £10,000 County of London 5 per cent. debenture stock available at 100, this being ex the interest due on the Monday in this week. About £10,000 London Power 5 per cent. debenture, with April and October interest, can be bought at 100¾, or a little less.

Foreign Electric Bonds.

The recent successful issue of Japanese 5½ per cent. bonds has had an indirect effect in drawing attention to Tokyo Electric 6 per cent. first mortgage bonds, of which there are £10,000 on offer at 94¼. The bonds are to bearer, involving, therefore, no stamp duty. The yield on the money comes to £6 7s. 3d. per cent., without taking into account redemption at 100 by 1953. Drawings are now in progress at 100 through the operation of a sinking fund which started last year. Allowing for repayment, the yield is 6½ per cent. on the money. There is an interest payment of 3 per cent. less tax due on the 15th of this month. San Paulo Tramway, Light and Power 5 per cent. perpetual consolidated debenture stock can be bought to a modest extent at 88, this yielding £5 13s. 6d. per cent. Interest falls due on March 2nd and September. Principal and interest are guaranteed by the Brazilian Traction, Light and Power Company, Limited, whose report has just appeared, showing a satisfactory increase over the earnings of the previous year. The President points out, however, in the company's report, that the operating results for last year appear abnormally high in comparison with those of the preceding year. The company is providing Rio de Janeiro with a new automatic telephone service. Those who are in the habit of regarding the Brazilian Traction Company as being little more than a railway undertaking can have no conception of the wide interests over which the company extends. It is one of the biggest concerns in Brazil, and its shares are a popular speculative counter in New York and Montreal, as well as in London. The present price is 52, but the lowest during 1930 has been 37, and last year it touched 33, the other end of the scale in 1929 being 94¾. The company's preference shares stand at 160, although so little is the amount of business done in these shares that the last recorded bargain in the Stock Exchange Official List is at 127, on March 14th of this year.

Home Electricity Supply.

In the group of London shares, Kensington ordinary have risen to 27s., St. James' and Pall Mall to 28s. 6d., and Charing Cross 4½ per cent. preference to 18s. These movements reflect a comparatively slight amount of demand. If there were to be any pressure to buy other shares in this list, the immediate result would be to put up prices to the extent of a shilling or so all round, because holders decline to sell, and the amount of floating supply is, in most cases, almost negligible. This applies particularly, of course, to the shares in the London electricity group. There is a wider range of choice amongst the provincial issues, though here the amount of stock on offer is not great. Northamptons have fallen back to 46s. 9d.; Isle of Thanet ordinary keep steady at 27s. 9d., Richmonds are unchanged at 43s., and Egham and Staines at 32. Manchester and Districts drooped to 25s., Newcastle-on-Tyne to 22s. 6d., Midland Counties to 27s. 6d. No alterations have occurred in British Power and Light at 14s. 6d. Atlas have gone back 9d. to 27s.; the preference are firm at 24s. 6d. Amongst the new issues, Scottish Power, after being a shilling premium, are on offer at that price, but the net change on the week is no more than a few halfpence. Both the Oxford Electric debenture stocks have gained a couple of points. The 4 per cent. stock is up to 98½, and the sixes are 97½. The Altrincham Electric

Supply made a profit last year of £28,120, which was £3,600 less than in 1928. The ordinary are quoted at 53s., the deferred at 16s. 6d., and the second preference at 23s.

The Manufacturing Group.

Telegraph Constructions are offered at 19½, this showing a fall of £1. The weakness is associated with the slump in Cables and Wireless stocks, though what the two have to do with each other must be left to an expert to decide. British Aluminium at 42s. 6d. are easier. General Electrics remain at 50s., and Associated Electrical Industries ordinary at 27s. Vague talk still persists of the possibility of there being either an agreement of interests or an amalgamation between these two companies in the more or less distant future. Crompton Parkinsons have been rather better, though no quotable change has occurred in the price, the ordinary being 23s. 9d., and the 8 per cent. preference 24s. 6d. It may be recalled that some little time ago gossip busied itself with the likelihood of amalgamation between Crompton Parkinsons and the English Electric Co., Ltd., though nothing definite materialised. Hall Telephone Accessories are 3d. lower at 14s., and the general disposition of prices amongst manufacturing companies' shares has been towards slightly lower levels.

Cables and Wireless.

There seems to be no stopping the fall in Cables and Wireless stocks. Every now and then a faint recovery occurs, but it is promptly followed by a renewed outbreak of selling. Within the past week, the 7½ per cent. "A" ordinary stock has lost 5½ points, slumping to 44½. The "B" stock, which was standing at 23½, is down to 19½, and even the 5½ per cent. preference, which might have been supposed to receive protection from the low Bank Rate and the present-day demand for investment securities, has fallen to 91½. The reason for the fall is the stereotyped one of apprehension in regard to the forthcoming dividend announcement. It is difficult to believe, in view of to-day's prices, that the "B" stock, now quoted at 19½, stood at 103 a year ago, what time the "A" ordinary stock was priced at about 90. The market is in a highly sensitive and nervous condition, which implies, of course, that if the dividend announcement should be better than is at present expected, a rebound would immediately occur. The flatness in Cables and Wireless is reflected in a fall in Globe Telegraph and Trust ordinary. The price is back nominally to 20, but shares can be bought more cheaply than this. At the round figure, the yield on the money, assuming retention of the 10 per cent. tax free dividend, is 5 per cent. free of tax, equal to nearly 6½ per cent. taking tax at 4s. 6d. in the £. Great Northern Telegraph shares at 30 are ex the dividend. Anglo-American Telegraph deferred has fallen a little to 24½. American Telephone and Telegraph at 238 show a couple of points gain. International Telephones are quiet at 66.

Dollar Stocks.

The decline to 126 in Montreal Light, Heat and Power shares brought in buyers, and there has been a recovery to 130. Shawinigan Water remains at 77. Pennsylvania Light and Power are 3 higher at 86½, Power Corporation of Canada being quoted at the same price, and British Columbia Power "A" shares weakened to 41½, the "B" to 21. Mexican Light and Power put on 3, advancing to 85½. The second mortgage bonds are lower, however, at 69. In the list of sterling shares, Anglo-Argentine Tramways second preference gave way to 2¾.

Home Railways.

Metropolitan consolidated ordinary stock has receded to 66 and District ordinary to 77 in consequence of the heaviness which has overtaken most of the stocks in this market. Underground Electrics are dull, the income bonds falling 2 points to 110; the £1 shares have held their previous price of 23s. It becomes necessary to repeat, in view of the running out of the time, that Underground income bonds must be exchanged for shares by the end of the current month. If this is not done, the company has the right to pay off the stock at 103. The result will be, therefore, that after June 30th Underground incomes will drop automatically to about the latter figure, so that holders should take the necessary steps, either to convert their debentures into shares, or to sell before this month expires.

Miscellaneous Matters.

Electrical Finance and Securities ordinary shares have risen to 2½, and the 5½ per cent. debenture stock at 98½ is a couple of points better. The disturbances in Rangoon are reflected in a fall to 11s. 3d. in Burma Electric Supply ordinary shares. About 1,500 Midland Electric Corporation ordinary shares have come on offer at 32s., at which they look reasonably priced. In 1927, the company doubled its ordinary capital, giving a bonus of 100 per cent. in ordinary shares, and in each of the two following years, 1928 and 1929, 8 per cent. was paid. At the present price of 32s. the yield is, therefore, 5 per cent. on the money.

Rubber shares are weak, in consequence of rubber having fallen to a lower price than has hitherto been recorded. Stocks on hand continue to mount up, though it is taken for granted that the holiday programme put into operation last month will have a beneficial effect in reducing the amount of rubber on hand. The iron and steel market is inclined to be heavy. At 57s. 6d. Babcock and Wilcox are a few pence easier.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom.	Approx. Dividend. 1928.	1929.	Price June 3 1930.	Rise or fall	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	37/6	—	5 4 3
Brompton Ordinary	1	8½	8½	26/6	—	5 5 8
Charing Cross Ordinary ...	1	8½	8½	27/6	—	5 1 10
do. do. 4½% Pref. ...	1	4½	4½	18/-	+1/-	5 0 0
Chelsea	1	8½	8½	26/6	—	5 5 8
City of London	1	10	10	33/3	—	4 4 6
do. do. 6% Pref....	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	38/3	—	4 3 9
County of London	1	7	10	47/6	—	4 4 5
do. do. 6% Pref....	1	6	6	23/-	—	5 4 4
Edmundson's 7% Pref. ...	1	7	7	24/6	—	5 14 3
Elec. Supply Corporation ...	1	11	11	47/-	—	4 13 7
Kensington Ordinary ...	1	8	8	27/-	+1/-	5 3 8
Lancs. Light and Power ...	1	7½	7	27/-	—	5 3 9
London Electric	1	8½	9	29/6	—	4 15 0
Metropolitan	1	9	10	41/3	—	4 17 0
do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6½	7	27/6	—1/-	5 1 10
Mid. Elec. Power	1	15	8	32/-	—	5 0 0
Newcastle-on-Tyne Ordinary	1	6	6	22/6	—9d.	5 6 8
do. 7% Pref. ...	1	7	7	25/6	—	5 9 10
Notting Hill 6% Pref. ...	10	6	6	10½	—	5 11 4
North Met. Elec. 6% Pref....	1	6	6	22/6	—	5 5 9
St. James' and Pall Mall ...	1	8	8	28/6	+1/-	4 18 3
Scottish Power	1	8	8	29/-	—	5 3 3
South London	1	8½	8½	27/6	—	5 1 10
Urban Ordinary	1	7	7	32/6	—	4 6 2
Westminster Ordinary	1	8½	8½	27/-	—	5 3 8
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	24/6	—	6 2 5
Yorkshire Elec.	1	8	8	33/-	—	4 17 0

HOME RAILS.

Central London Ord. Assented ...	Stock	4	4	77	—	5 4 0
Metropolitan	,,	3½	4	66	—½	6 1 3
do. District	,,	4	5	77	—½	6 9 10
Underground Electric	£1	7	8	23/-	—	6 19 2
do. do. Income ...	Bonds	6	6	110	—2	5 9 1

TELEGRAPHS AND TELEPHONES

Anglo-Am. Tel. Pref.	Stock	6	6	103½	—	5 16 0
do. Def.	,,	1½	1½	24½	—½	6 2 5
Automatic Telephone	1	10	12½	37/6	—	6 13 4
Cables & Wireless 5½ Pref....	Stock	—	5½	91½	—1	6 0 3
do. A 7½ Ord.	,,	—	—	44½	—5½	... ...
do. B Ord.	,,	—	—	19½	—4	... ...
Globe Tel. and T. Ord.	10	10	10	20	—½	*5 0 0
do. do. Pref. ...	10	6	6	11¼	—	5 9 1
Great Northern Tel.	10	20	20	30xd	—15/-	6 13 4
Marconi-Marine	1	12½	15	14½	—	7 14 8
Oriental Telephone Ord.	1	12	12	55/-	—	*4 7 3

HOME AND FOREIGN TRAMS, &c.

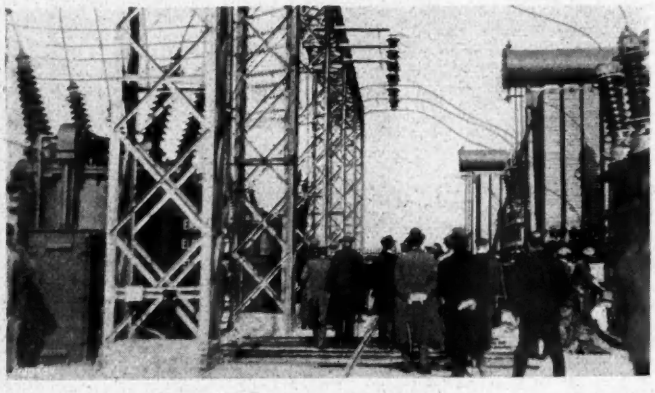
Anglo-Arg. Trams First Pref. ...	5	5½	5½	2¾	—	9 11 2
do. do. 2nd Pref. ...	5	6	6	2¾	—¼	10 18 2
do. do. 5% Deb. ...	Stock	5	5	68½xd	—	7 0 0
British Electric Traction Def. Ord.	,,	5	5	1725	—25	... ...
do. do. Pref. Ord.	,,	8	8	126½	—	6 6 6
Brazil Traction	100	7	8	52	+½	3 17 0
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	94⅝	—	5 7 0
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	10/-	—	... ...
London United Tram Deb. ...	Stock	4	4	59½	—	7 12 4
Mexico Trams, 5% Bonds	—	5	5	70	—	7 2 10
Mexican Light Common	100	Nil	Nil	85½	+3	... ...
do. 7% Pref.	100	7	7	76½	—	9 3 0
do. 1st Bonds	—	5	5	81	—	6 5 0
Victoria Falls Ord.	1	15	15	62/6	—9d.	4 15 10
Yorkshire (West Riding)		Nil	Nil	5/-	—	... ...

MANUFACTURING COMPANIES.

Assoc. Elec. Ord.	1	6	6	27/-	—	4 9 0
Babcock & Wilcox	1	13	15	57/6	—6d.	*5 4 4
British Aluminium Ord.	1	10	10	42/6	—6d.	4 14 1
British Elec. Transformer Pref. ...	1	7	7	8/9	—	... ...
British Insulated Ord.	1	15	15	37½	—	4 0 0
Brush Ord.	Stock	10	10	120	—	8 6 8
Callenders	1	15	15	38	—	4 3 0
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Ord.	£/-	—	30	23/9	—	6 16 4
do. 8% Pref.	1	8	8	24/6	—	6 10 8
Edison-Swan 1st. Pref.	1	7½	7½	24/6	—	7 1 2
do. 5% Deb.	Stock	5	5	84½	—	5 18 4
Electric Construction	1	5½	5	18/3	—	7 11 0
Enfield Cable Ord.	1	20	20	4½	—	4 14 1
English Electric	1	Nil	Nil	9/9	—	... ...
do. do. Pref.	1	8	Nil	7/6	—	... ...
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10 7
do. Ord.	1	10	10	50/-	—	4 0 0
Henley	1	25	30	6½	—¼	4 15 10
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India- Rubber	1	Nil	Nil	10/-	—	... ...
Johnson & Phillips	1	10	10	1½	—	5 6 8
Siemens Ord.	1	7½	7½	24/6	—	6 2 5
Telegraph Construction	12	10	10	19½	—1	*6 3 1

* Dividends paid free of Income Tax.

The Eastbourne Convention.



Brighton Grid Sub-station.

Incorporated Municipal Electrical Association.

No. 3.—*A continuation of our report on the proceedings and social functions.*

THE habit is easily formed of regarding each I.M.E.A. Convention as the most successful on record. Yet there probably is no valid reason to suppose that there can be great differences in the merits of any of the long series that has grown up under the guidance of Mr. A. C. Cramb, who may claim to be one of the foremost promoters of adult education of our era. The chief variable factor is the weather, and at Eastbourne the complete change to summer conditions on the forenoon of the first day provided an omen justified by the event.

A constant denominator is the I.M.E.A. atmosphere of friendliness and goodwill, the meeting of the same faces year after year giving a pleasing sense of a family reunion. On the other hand, each occasion brings new members to lend variety and to enlarge the number of our acquaintances.

Many of the leading spirits to whom these conventions owe their quite definitely happy character have passed across the field of our camera, and some photographs of typical groups of personalities are reproduced in this issue. Prominent among them are Mr. J. K. Brydges (president), Mr. A. C. Cramb (honorary secretary), and Mr. J. W. Simpson (secretary), all of whom were indefatigable in their efforts to make the week the success it was.

It was implied above that I.M.E.A. Conventions have an educational influence, and Alderman W. Walker, during the discussion on the paper on the obligations of electricity committees, attributed the decline in that "dishonest proceeding" of taking profits in relief of rates largely to lessons learned at these Conventions. That, we believe, is quite likely, just as the enlargement of ideas obtained in Convention surroundings has resulted in support for the four bodies referred to in the presidential address—E.D.A., E.R.A., B.E.S.A., and the E.A.W. It is to be hoped that the same kind of influence will modify such standing orders as those in force at Eastbourne which limit the tenure of office of a chairman, even of a trading committee, to two years. That is the only thing we can say against Eastbourne, and even this may be turned to its favour as, in the case of Alderman Chatfield, the Council has shown discrimination in suspending the operation of standing orders for one year at least.

The discussion of the pulverised-fuel paper elicited information of a practical nature from supporters both of that system and also of stoker-firing. Some speakers rightly deprecated dogmatism at the present stage, as even the respective merits of unit and central systems of pulverising have their convinced advocates, and it was quite evident that excellent results could be obtained in differing circumstances with either pulverising or stoker plant, or with both combined, on the largest boilers. There being little difference on thermal grounds, one must look for other factors, and the most obvious advantages of pulverised-fuel firing appear to lie in the governing of boilers to meet heavy fluctuations in demand (especially under grid operation) and in the reduction in operating staff.

The discussion on the heating of buildings was combined with a discussion on water heating, which appropriately took place on "Women's Day"—Thursday. Members of the E.A.W. took a good part in the discussion, and kept the engineers from dwelling too much on technical aspects. Indeed, members of the E.A.W. were throughout the week very much a part of the life of the Convention, and provided evidence that high purpose is decidedly compatible with much that makes life desirable in this world of ours. On Women's Day was taken the appropriate photograph bearing the title of "The West Hartlepool Progression," in which the borough electrical engineers of that town for the past 15 years will be recognised: Mr. J. W. Spark (1915-25), Mr. J. H. Parker (1925-1930), and Mr. H. E. Blackiston, whose appointment we recently reported. If the statures of the successive engineers may be regarded as indicating domestic consumption, the annual rate of increase should be well maintained. This will no doubt be largely determined by the power seen behind the throne. In Mrs. Spark's time the E.A.W. unfortunately did not exist; Mrs. Parker was the first branch honorary secretary, and she has now handed on the torch to Mrs. Blackiston.

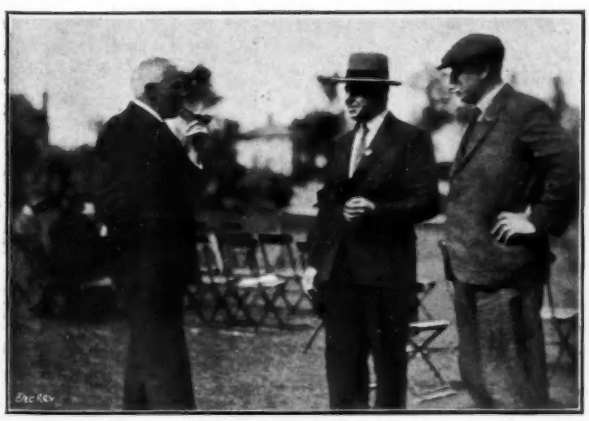
Apart from the papers, the chief feature of technical interest was the visit on Wednesday afternoon to the Brighton power station and to the grid sub-station, which were described in our last issue. The features which attracted the most attention were, in the power station, the Ferranti scheme for metering grid supplies, the disproportion in sizes related to outputs of the newer 3,000 r.p.m. turbo-alternators and the older sets, and the elaboration of instruments for measuring the performance of the new boilers. The trend shown in the last named will be welcomed by older engineers who used to lament the anomaly of the refinements of measurement on the switchboard and in the engine room contrasted

The I.M.E.A. at Eastbourne.

The Winter Garden, Devonshire Park.

Members at The Royal Pavilion, Brighton.

Mr. and Mrs. E. G. Batt, Miss N. Harpur, and Messrs. E. Eaves, T. G. Travis, A. M. Anderson, and H. Neilson.



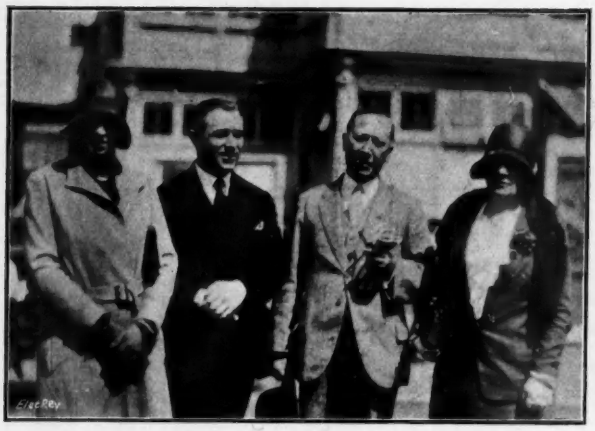
Messrs. R. W. L. Phillips, D. W. Barham, and C. J. Wood.

Mr. G. J. Berry and Mr. W. M. Selvey.

Mr. G. Porter and Mr. I. V. Robinson.

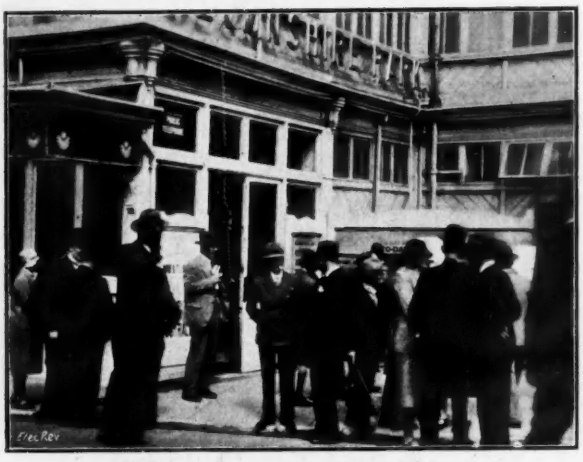
The President.

The New O.L.A. President is Congratulated.



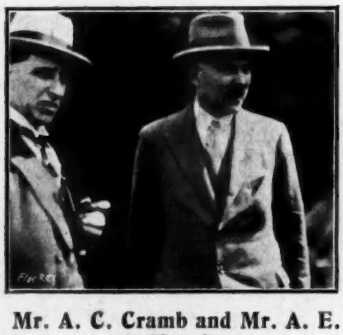
Mr. and Mrs. L. C. Penwill with Mr. and Mrs. Willoughby-Ellis.

Alderman W. Walker and Mrs. Peattie.



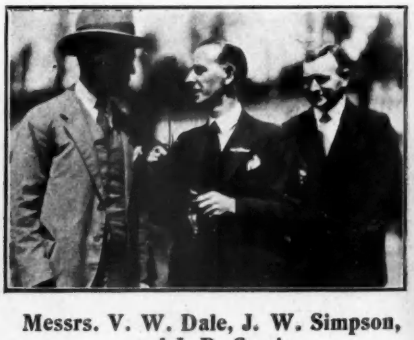
Before the Discussion on Water Heating.

Entering Brighton Power Station.

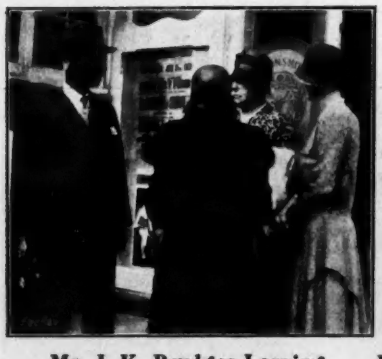


Mr. A. C. Cramb and Mr. A. E. McKenzie.

Mr. F. W. Purse Relating an Anecdote.

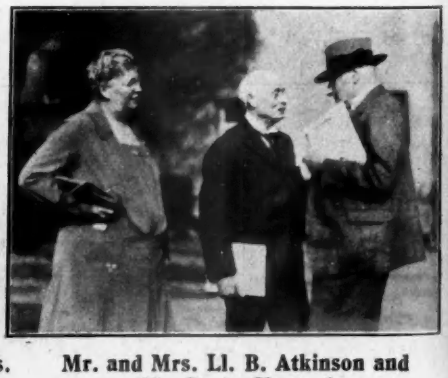


Messrs. V. W. Dale, J. W. Simpson, and J. R. Cowie.

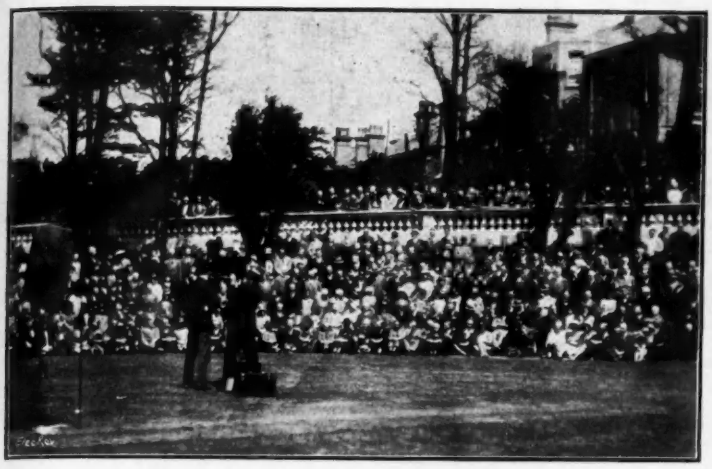


Mr. J. K. Brydges Leaving a Conference.

Mr. and Mrs. Rycroft, Mr. and Mrs. Campling, Mrs. W. A. Smith, and Mr. W. J. Jones.



Mr. and Mrs. Ll. B. Atkinson and Mr. R. A. Chattock.



Members Grouping for Official Photograph.

A Short Putt by Mr. John Christie.

Miss Haslett with Mr. and Mrs. J. H. Parker.

Discussing the Programme.

A 132-kV Grid Insulator.

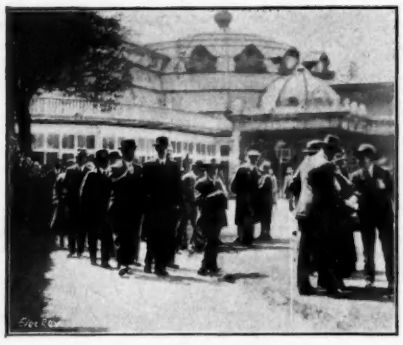
Ald. E. Huntsman and Colleagues.

Members of the E.A.W.

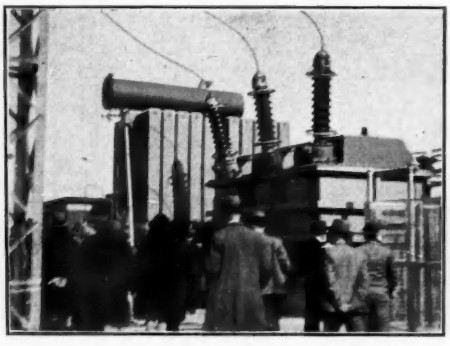
The Past-President and Mr. W. M. Selvey.

A Grid Connection in Miniature.

Miss Y. Z. de Ferranti, Mr. John Christie, and Company.

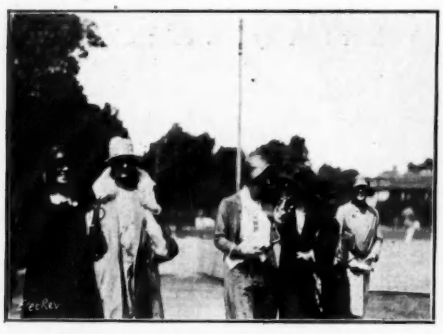


Inside Devonshire Park.



Grid Transformers at Brighton.

A Portent of the Skies.



The E.A.W. Leaving the Exhibition.

The West Hartlepool Progression.

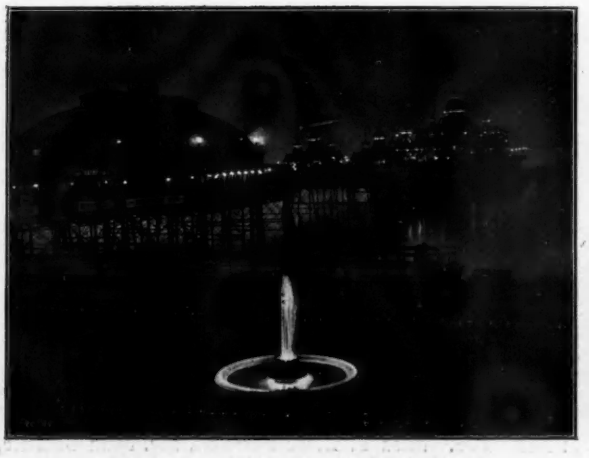
Motor Coaches Leaving for Brighton.

Messrs. E. E. Hoadley and Russell F. Ferguson.

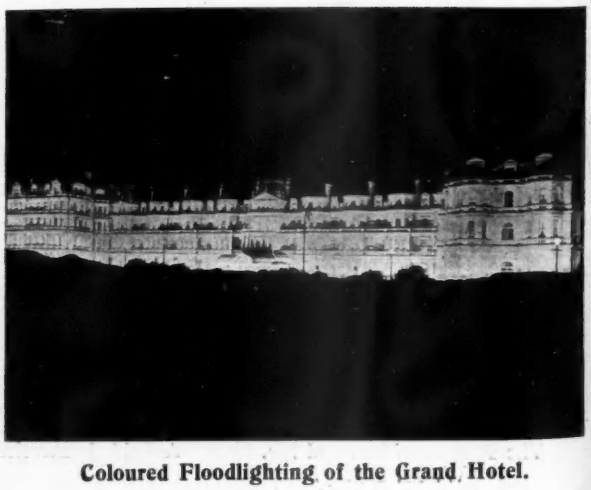
Mr. E. J. Jennings.

A Group of Leading Personalities.

The Director of the E.A.W.



The Pier and Promenade by Night.



Coloured Floodlighting of the Grand Hotel.

with their absence in the boiler house, where most of the preventable losses occurred. At the sub-station, members appeared to find the tap-changing gear the most interesting novelty.

The drive over Beachy Head was somewhat marred by mist, possibly the penalty of the glorious sunshine below, which gave a healthy "out-of-door" appearance even to those who had spent the previous daylight hours in the lecture hall or exhibition at Devonshire Park. The return journey was made *via* Lewes; this gave visitors an opportunity of comparing the true appearance of the 132-kV line with the preposterous forecast figured in the great lapse of *The Times* some months ago, a lapse as lamentable as it is fortunately rare. While at Brighton, at the invitation of the Corporation Electricity Committee and Council, tea was taken at the Royal Pavilion, where an opportunity was given to examine this once notorious scene of gaiety with its splendidly rococo decorations. Above 500 people, conveyed in 23 motor coaches and a large fleet of private cars, took part in this trip.

At the dinner on Thursday evening the attendance numbered about 315. The speeches were not so long as last year, but the acoustic properties of the hall were not good, and the evening was hot. It was quite clear from the prolonged applause which followed the promise of one of the speakers to be brief that the diners, untired by three evenings of dancing, were anxious to be released for a similar opportunity of exercise.

During the dinner the result of the Dennis trophy golf competition (in aid of the I.E.E. Benevolent Fund) was announced. Capt. H. J. Kennard was declared the winner (net score 71), with Mr. J. H. Rothwell (hon. solicitor) as runner up.

In addition to the official arrangements there were several unofficial surprise items that brightened the week. Most impressive was the coloured floodlighting of the Grand Hotel by the use of flood lanterns giving two beams of light from Mazda lamps, which formed a striking colour gradation. The installation was designed by the Edison Swan Electric Co., Ltd., and the work was carried out by Messrs. H. Beney & Co., of Eastbourne. Other conspicuous examples of floodlighting were those which illuminated the front elevation of the public library and the fountains on the sea front, which were carried out by the General Electric Co., Ltd. Then, again, the eyes of those returning from the opening celebrations were attracted to the brightest object in the firmament on that night of stars and stillness. It proved to be the "Pearl Osram" balloon under the rays of a powerful projector.

Eastbourne has been styled the "queen of watering places." There are other claimants to the title, but these will receive no support from the 1,102 members of the 35th I.M.E.A. Convention, who will be more inclined for the moment to accept the view of the Mayor that Eastbourne should be always the scene of their meetings.

Next year their affections will, no doubt, be transferred to Douglas, I.O.M., where Mr. A. J. Fuller will preside.

Obligations of Electricity Committees to Municipal Electricity Undertakings.—(*Abstract.*)

By ALDERMAN R. S. CHATFIELD.

(*Chairman, Electricity and Street Lighting Committee, County Borough of Eastbourne.*)

No municipal committee does more, or shoulders bigger responsibilities, to promote the general well-being of the community, not only in regard to its health, its comfort, its safety, but also its prosperity and advancement, than does the electricity committee. Electricity has so permeated every human activity to-day that it can safely be described as an essential raw material for every form of manufacture and commerce. It follows, then, that the deliberations of an electricity committee are just as important nationally as locally, for it has to provide for the future just as much as for the present; unless future requirements are properly and efficiently anticipated, industrial development will be retarded and, in turn, militate against the prosperity of the country. There must be a very large number of members of electricity committees who have not really taken their responsibilities to heart, or probably have never really considered their obligations.

The newly-elected committee-man must, first of all, realise that he has become directly associated with a great and important industry with enormous possibilities of development, both in respect of supplies for lighting, heating, and cooking, and in respect of the provision of electrical apparatus, which, apart from its importance in improving the load factor, also provides opportunities for profitable retail trading, either direct, or by arrangement with the local branch of the Electrical Contractors' Association, in the department's showroom.

His obligations do not end with attendance at meetings and taking an intelligent interest in the proceedings. He must seize every opportunity of educating non-consumers to the abiding benefits of electricity. His general interest in matters electrical should not be confined to his own undertaking; only by knowing what is going on outside his own undertaking can he acquire an adequate knowledge of the subject. He should obviously practise what he preaches and use electricity and electrical appliances in his own home.

The proper function of a committee is to direct the policy of the undertaking. Its members should be regarded as holding a watching brief, examining from an outsider's point of view the relations between management and consumers. They have to decide what they consider best in the interests of all parties and, having sought the assistance of practical advisers, particularly the chief engineer, see that their plans, which are destined to promote the wider use of electricity, are brought to maturity. The committee-man must use his best endeavours to ensure that the benefits of a continuous supply of electricity are available to every ratepayer, whatever his means may be, and that such supply is given as cheaply as possible. Future extensions and developments require constant attention. Only the inability of people to afford the cost of installation has hindered the more rapid growth of electricity supply in this country. Many committees are keenly alive to the fact that some method must be devised of providing non-consumers with supplies which they can afford. There is not the slightest doubt that everyone wants electricity, but it is not everyone who can afford to pay cash down for the necessary wiring, &c. A number of schemes are in operation throughout the country, the most popular probably being the assisted-wiring scheme; it certainly means tying up capital, but in the long run it is highly productive and profitable. The surest way of promoting a wider use of electricity is to introduce cheap rates, and if present electricity rates are economically too high every avenue should be explored to see if the granting of special rates is possible.

Having provided the ratepayers with cheap rates and placed them in a position to take supplies, it develops upon the committee to so handle finance and so fashion its outlook that facilities for rapid development are made possible, and, when carrying out extensions, to take a very long view to ensure that distributing mains of ample capacity are laid to meet future needs for at least five years. Owing to the fact that the future had not been fully provided for, all sorts of difficulties have been met with when extensions have been needed. Fully developed land with highly valuable capital sites has had to be purchased purely through lack of vision when the initial system was laid down. Particularly in new districts the rule must always apply that the planning of the distribution system is settled at the time of planning the streets. Land should be acquired when yet in the agricultural state, making full provision for supplying the new area, and protecting it against the spoliation of its amenities by kiosks and sub-stations being erected wherever they can be squeezed in. Considering the distribution system last is like a plumber coming in after a house has been built and opening up the floors to lay the water pipes; town planning experts tend to treat electricity in a like manner.

The committee-man, as a representative of the people and a trustee of his own undertaking, must take his share of the responsibility of seeing that his undertaking is run on sound business lines. The suggestion offered is that the electricity committee should be independent of any other committee and have, so far as may be possible, plenary powers, reporting from time to time to the Council as a whole, which would judge it on its balance sheet in the manner of shareholders. It is practically impossible for the electricity committee to make suggestions for expenditure for development work, &c., to a separate finance committee, as members of that committee can have no possible knowledge of the requirements of the undertaking, and the duties and responsibilities of the committee may be hindered in consequence. It is necessary, however, that the electricity committee should have at all times opportunities for consultation with the Corporation's financial adviser.

"Service" is closely wrapped up with showrooms and requires close attention. It is not good practice to have all sorts and makes of electrical appliances in a showroom as it only leads to confusion; a better method is to test thoroughly various manufacturers' products, and have a good selection of the best.

Good street lighting is an essential factor to the comfort, convenience, and safety of the community in these days of fast-moving traffic. Great care must be taken to ensure that it is adequate, attractive, and in harmony with the local conditions; special lighting of certain features requires painstaking attention, as upon this depends to a large extent the popularity, and therefore the prosperity, of the district.

The subject of the utilisation of profit has been argued on many occasions. Some contend that, as it is the surplus

of a trading undertaking, it belongs to the ratepayers, and that in the event of profit being made the surplus should be used for the relief of local rates. This theory is, however, economically wrong. The committee is responsible for the development of the supply in its area, and any surplus should be set aside for such development work and building up adequate reserve; not before every householder is provided with a supply cheap enough for its use for power as well as lighting should the surplus be allocated for the relief of rates. If annual profits be used for rate relief, consumers will never be able to have cheap supplies, growth will be hindered, and the goodwill of the undertaking will suffer.

An ordinary commercial business has outside competition to contend with, and in order to compete successfully must keep its organisation efficient and up-to-date, but a monopoly undertaking has not that incentive and special care must be taken to prevent its slipping into a "good enough" policy. As a rule municipal undertakings can be financed more economically than other concerns, but nevertheless care must be exercised in the method of borrowing, and loans placed with due regard to the effect on the price per kWh. Depreciation, too, is an important factor. In theory, provision for the repayment of borrowed capital should be sufficient reserve for depreciation, but in an electrical undertaking it has been found by experience that obsolescence and breakdown risks render it imperative to provide a reserve fund of sufficient strength to meet these unforeseen contingencies. It is advisable, however, to scrutinise these requirements carefully, as too large a suspension of profit, both on reserve and as working capital, is undesirable for obvious reasons.

The high rate of income tax now prevailing raises the important question of the advisability of earning profit in any undertaking. Prior to the Electricity (Supply) Act, 1926, there was a right of set-off against the general rate fund liability after allowance for tax retained by deduction from loan interest paid by the undertaking. Up to March 31st, 1930, however, the inland revenue authorities contended that the set-off was limited to 1½ per cent. of the outstanding debt. In Eastbourne it has the effect of reducing the set-off figures from £22,000 to £4,200, or a cash loss to the town of £3,560. After that date the set-off will be lost unless the reserve fund amounts to one-twentieth of the aggregate capital expenditure. This being so, it seems folly to earn a large profit for the sake of paying income tax rather than benefiting consumers by a reduction of the price per kWh.

In conclusion, the author may be permitted to refer to the obligation of the electricity committees, individually and collectively, to support all those various associations which are so closely associated with electrical development. He points out that it has become necessary to consider many of the problems arising in municipal electricity supply from a national rather than from a purely local aspect, and the view sometimes expressed in the past that an electricity committee can satisfactorily conduct its own business without relation to or interference from any outside body can now seldom be held. Combination with other undertakings and co-operation with associations having definite objects is becoming increasingly necessary. Many electricity committees have not yet realised their obligations in this respect; contributions to associations which specialise in electrical development cannot be regarded otherwise than as wise and progressive expenditure

Discussion on Ald. Chatfield's Paper.

In the course of supplementary remarks the author expressed the view that every electricity committee should have placed upon it the obligation of adopting a rental wiring scheme, and that the adoption of some form of multi-part tariff was necessary to encourage the use of electricity during the day time. There had, he said, been a great demand for rental wiring in Eastbourne. The hostility of councils to the erection of sub-stations in certain spots was due in most cases to ignorance of the absolute necessity for such sub-stations. It was often argued whether the expenditure was justified, and he contended that unless members of councils and committees took greater and more intelligent interest in the necessities of their electricity undertakings than had often been the case in the past, the people's representation on electricity committees would become a farce.

Alderman H. B. Vorley (Islington) differed from the system in Eastbourne of allowing chairmen of committees to act for only two years. His view was that when a good chairman was found the council should stick to him, because it necessarily took some years for a man to receive a thorough training as chairman. Much the same applied to the vice-chairman, because in most cases he eventually became chairman. The obtaining of sub-station sites in congested areas by means of the 1909 Act's compulsory powers was a remedy worse than the disease, because the delay in putting those powers into operation was such that it was worth while paying twice the market value of the land, or property, in order to get ahead quickly. In the meantime something should be done so to alter the law that sub-station sites could be obtained much more quickly and less costly. He imagined there was now no difference of opinion on the view expressed in the paper that local rates should not be relieved out of profits. (There were a few cries of dissent). If not, added Alderman Vorley, those who held the opposite view would surely be converted before the next Convention. Whilst it was difficult to train members of electricity committees, he felt it was far harder to train members of finance committees. Although he agreed with the author that the ideal way would be for the electricity committee to go straight to the council, he believed it would be a long time before councils generally would adopt that view. It was not always recognised that the finance committee was not a sort of court of appeal to which the electricity committee must put its problems to be accepted or turned down; the finance committee should be limited entirely to the financial side. A recently issued confidential report of one of the large public bodies clearly defined what the duties and functions of a finance committee should be, it being laid down that the technical aspect of any proposals from the electricity committee should receive the greatest weight.

Alderman A. E. Gough (Cardiff) expressed the view that it was very dangerous to have too many experts on an electricity committee, because they would be certain to disagree. To that extent, therefore, it was undesirable to have committeemen who were such experts that they would always disagree with the engineer, because when a layman acquired a little technical knowledge he was always liable to become more obstinate than the man who knew just how much he did know. Fortunately, in the majority of cases, the committee as a whole accepted the advice of the engineer. In Cardiff it had been impossible for a long time to persuade all members of the Committee that supply extension to the poorer districts was a real commercial proposition, but the fact was that so soon as electricity was introduced into a street it was quickly used by all the residents therein, especially with some system of assisted wiring. That had been their experience in Cardiff. Whilst agreeing that all profit should go to the reduction of charges, at the same time they should not be too hasty in reducing charges to consumers, because annoyance was created among the consumers if the charges were continually changing. A fairly reasonable tariff maintained for a number of years was better than constant fluctuations up and down. Cardiff had suffered from the relief-of-rates mania and, in taking huge slices of profit from the electricity undertaking for the relief of rates, councils were doing something which they would be sorry for eventually, because a time would come when it could not be done any longer and then the councils would have to find money elsewhere and explain to the ratepayers the difficulty they were in. Whilst there was a limit of 1½ per cent. of the outstanding capital liability as the amount that could be applied to the relief of rates from electricity profits, finance committees were inclined to insist on additional borrowing in order to secure as much as possible, whereas, as in the case of Cardiff, sums could be taken from the revenue of the undertaking for such things as assisted-wiring schemes. It was suggested, for instance, that £20,000 should be taken from revenue for that purpose in Cardiff, but the Finance Committee said the amount should be borrowed in order that more might be available for rate relief. He strongly supported the views of the author in favour of subscribing to the various associations of the industry and deprecated the narrow view often taken with regard to that matter. A little more propaganda in that respect among the members of councils and committees might help to bring about a change of attitude.

Alderman W. Walker (Manchester) said the author might have gone farther than he had and written a chapter on "How to Explain the Obvious." There was a Lancashire saying that there was "nowt so queer as folk," and on some electricity committees were assembled some of the queerest specimens that it was possible to imagine. At the same time, as the result of his experience of the past 2½ years at close quarters with representatives of practically every electricity committee in the United Kingdom, he could say at once how earnestly the great majority of the committees attempted to do their work and what a feeling of responsibility they had towards the communities they were serving. On the other hand, some members of electricity committees took the narrowest point of view, had a feeling of horror at the idea of any advancement, and had never been able to grasp the fundament reason why they were on the committees. Thanks to the I.M.E.A., however, there had been wonderful education. Some 20 years ago Dr. S. L. Pearce, then in charge of the Manchester undertaking, read a paper at the Harrogate Convention in which he argued against using profit for the relief of rates. At that time the great bulk of opinion was in favour of that dishonest proceeding, but they heard that morning how meek and lamb-like was the "No" that had greeted the remark of Alderman Vorley; it was simply the dying gasp of the old brigade. One matter which caused electricity committees some difficulty was the right to demand a revenue equal to 20 per cent. of the capital expenditure upon any particular supply. His view was that, whereas it might not be justifiable to ask for such a guarantee in the case of a more or less developed area, it was perfectly justifiable in special instances in which the property to be supplied was isolated and some distance away. In such cases the consumer should be asked to bear his fair share of the extra charges the undertaking was put to in giving the supply. A feature which all committees should bear in mind was that they should endeavour to secure the confidence of their council, because, if they conducted their affairs in such a way that the council as a whole was satisfied the undertaking was being run on sound and business-like lines, there would be very little difficulty in getting new proposals of a progressive

character passed. With regard to the 1½ per cent. of the outstanding capital liability which could be taken for relief of rates, since March 31st last the powers of finance committees in that respect had been considerably curtailed, because that amount could only be taken if the undertaking had accumulated a reserve fund equal to 1/20th of the aggregate capital expenditure. The enormous amount of research being carried out for the industry by the various organisations mentioned in the paper, and the great value to all undertakings of the British standard specifications, indicated the fairness of the various undertakings bearing their fair shares of the cost of that work as suggested in the paper. One effect of team work in the industry which should be supported by all undertakings was the introduction of a standard cooker, work in which the manufacturers, the I.M.E.A., and the power companies had been associated; they now had a standard line of appliances for domestic use which would be capable of replacement at minimum cost.

Alderman E. Huntsman (Nottingham, president of the E.D.A.) said there might be circumstances in which rate relief from electricity profit would be justifiable. They should not always act merely as electricity committees on all occasions; however, he would not pursue the subject. It had to be recognised that electricity supply to-day was a semi-nationalised business, no longer of the exclusive concern in any area of any large or small local authority. With a view to ensuring that electricity committees should be kept in touch with developments in other parts, he would favour taking whole committees to inspect, for instance, the Gennevilliers station in Paris and other large Continental stations. When he was confronted with the building of a new power station in Nottingham he had taken his Committee to Paris to see the big power station there. His view was that the inspection of such power stations should not be limited. as they so frequently were, to engineers; he would make it incumbent on every chairman and vice-chairman, with the engineer, to spend a fortnight per annum inspecting the large centres of Europe where electricity supply was most highly developed, because, although the task of developing supply in this country had been placed upon the C.E.B., that body would find it very difficult unless it had sympathetic minds to co-operate with in the various districts.

Mr. W. C. P. Tapper (engineer and manager, Stepney) thought the paper was timely, because committees would in future have mainly to concentrate on distributing and selling electricity. In that connection the work of E.D.A. was specially important, but unfortunately many committeemen did not appreciate what that organisation was really doing; it could be very much more important if all electricity supply undertakings subscribed on the full scale. When the late Dr. S. Z. de Ferranti became president of the E.D.A. he at once set up a committee to try and arrive at a suitable domestic tariff which could be used universally all over the country. Unfortunately, almost as soon as the Committee got to work it lost Dr. Ferranti, and the work had, perhaps, to some extent flagged, but it should be pushed forward with the utmost diligence. As regarded assisted wiring, very much more could be done in that direction than was the case at present in some instances. In Stepney, as a result of three years' effort, 3,500 consumers had been connected on an assisted wiring scheme, and the revenue from them represented £13,000 per annum. The capital invested in wiring and apparatus was £114,000, but not a penny had been borrowed; it had all been taken from reserve, but of course the whole of that amount was not outstanding, as a great deal had been recovered and used for additional work. A pre-payment meter which would collect, say weekly, a standing charge was very much required. He had not found one, but one would probably be developed in the near future. For the development of electricity supply on the right lines they needed a suitable tariff, an assisted-wiring scheme, and an effective selling organisation.

Councillor H. Coates (Watford) said that, although he was a member of the Institution of Electrical Engineers, he always made it a practice, as chairman of the Committee at Watford, to discuss with the engineer the details of his proposals and to appreciate the engineer's point of view. The latter usually got his way, even if there was a difference of opinion, but by spending some time with the engineer before any proposal went to the Council the chairman would be in the best position to deal with criticism from members of the Council. Tariffs for large consumers were best left to the engineer; a large undertaking in Lancashire recently missed a wonderfully good consumer with an excellent load, owing to the fact that a few Committee men could not appreciate why the charge for lighting should be 6d. for ordinary domestic consumers and only a fraction of a penny for that very large user.

Alderman R. S. Chatfield did not reply to the discussion, but in the course of a few remarks on what electricity offered to the person of small means, said he was an engine driver, but he had had a small chimneyless house built in which he relied upon electricity for every domestic purpose. He suggested it was part of the duty of electricity committees to scrutinise town-planning schemes and estate plans for their districts generally with the object of seeing if it were possible to acquire sub-station sites cheaply before the cost of the land increased, or before the land had been built on.

Pulverised-fuel Firing as Affecting Economic Boiler-house Operation.—(*Abstract.*)

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The paper reviews certain factors which affect economic steam production and traces their influence on the trend of modern boiler-house design. The main features portray the plant under the author's control, but in order to demonstrate more clearly these factors a great deal of information collected from other sources has been included, irrespective of whether the views expressed coincide with the author's or not.

The ultimate test of all commercial development must inevitably be the crucial one of economy, both technically and financially, and it is the primary purpose of the paper to justify modern developments in boiler-house design and operation, particularly as applying to pulverised-fuel firing, from this point of view.

The following quotation from an operating report dated January 26th, 1930:—

> "Owing to the failure of the induced draught fan on No. 24 boiler, it was necessary to bring No. 26 steam generator into service as quickly as possible. This was brought up to range pressure in a period of 9 minutes and 15 minutes after lighting off was evaporating 65,000 lb. of steam . . ."

by no means represents an individual feat, but is the regular procedure with the latest plant now in service operation. There is justification for the technical and commercial claims made for higher steam temperatures and pressures. In many cases they cannot be justified on financial grounds alone, but when their desirability is indicated there are no technical reasons why they should not be used. The higher figures are usually justified on the score of lower station cost per output generated, higher thermal efficiency, and lower capital cost, due mainly to the reduction of overall boiler dimensions. Capital cost is usually the deciding factor. While furnace volumes have been largely responsible for the reduction in floor space, the increase in evaporation per sq. ft. of heating surface has also assisted, as is apparent from the practice now generally in force whereby boilers are rated at a normal capacity which corresponds to their most efficient load, a maximum continuous rating, which is anything up to 25-30 per cent. above the normal rating, and, finally, a peak rating generally some 50 per cent. above normal rating, which is a rate at which the boiler will supply a sudden demand for a short period. One of the primary influences on the possibilty of increased rates of evaporation is the induced- and forced-draught fan capacities. If they are sufficiently liberal, the boiler evaporation can be pushed to unexpected rates, particularly in the case of powdered-fuel installations.

Even if comparatively expensive in first cost, the savings effected by the use of control and recording instruments will in a very short space of time more than cover the expenditure involved. The day of individual control by personal experience is rapidly disappearing, and the only way to attain maximum efficiency in coal consumption is to have means of following the load demand as closely as possible.

Feed-water heating and steam bleeding from the turbine are established practices, and their extended use has brought about continuous advance in design; in nearly all modern plant evaporated water is used for boiler feeding. With the high and positive circulation resulting from the more recent designs of boiler, continuous operating periods of nine months, and even longer, without shut-down, are not only possible, but will in time become the rule.

It has to be remembered that the fundamental function of every boiler plant is that of a heat-reclaiming unit, and it was for this purpose that those responsible for the design of air preheaters turned their attention to this aspect of the case. The latest plant now in operation at Derby and other places shows how the boiler has really become an integral part of the furnace, since, in effect, the furnace is surrounded by the boiler-heating surface. We have now reached the stage at which the terms "boiler" and "furnace" are practically synonymous, and the high-pressure heating surface is reduced to a minimum. It will be apparent that there is still a large amount of heat reclamation to be performed after the gases have left the interior of the boiler proper. It is here that the steaming economiser and air preheater play their parts. If the temperature of the leaving gases is sufficiently high, the normal economiser becomes a low-temperature boiler, the final heat extraction from the gases being performed by the air heater and returned to the furnace proper as preheated air. It will be appreciated that this heating surface is the cheapest part of the heat-reclaiming unit, since it is subject to no steam or water pressure of any description. The most economical use has been made of the heat-extracting material in the boiler, since only the most efficient portion is subject to the full steam pressure and temperature. The importance of the advances made in boiler design from this development is apparent when comparing it with the settings now becoming general for stoker-fired plant. In effect, the stoker designer is following in the steps of his youthful brother, the pulverised-fuel engineer.

The travelling-grate stoker in particular has been developed in an effort to combat challenges from other styles of equipment, and it has to be admitted that it retains at present its position as the most widely used apparatus for water-tube-land-boiler firing in Europe. A few installations of retort-

type stokers have been made in this country recently, but it has still to be demonstrated that this type of apparatus is capable of dealing with the many grades of fuel which are being burned on travelling grates.

With the object of presenting the subject without bias, a questionnaire was sent to many of the foremost engineers in this country, municipal and industrial, in order to ascertain their opinions upon actual experience of operation. It met with a most gratifying response, and in the majority of cases the opinion is favourable to the adoption of pulverised-fuel firing and that the capacity of plant operated with this system represents a large volume.

With this record at hand* one can compare disadvantages with advantages.

Disadvantages.—Most of the early pulverised-fuel installations had disadvantageous features, such as :—

1. Preparation costs associated with the drying and pulverising of the fuel.
2. The difficulty of storage connected with central or bin-and-feeder systems.
3. Feeder and burner problems associated with correct combustion conditions.
4. Heavy furnace maintenance was experienced on many plants.
5. Slagging troubles associated with coals having a low ash fusing temperature.
6. Bird-nesting of boiler tubes.
7. Air-vent nuisance, or leakage of coal dust internally or externally.
8. Disposal of the ash, which still remains without a market.
9. Emission of dust.
10. The human element, which is generally averse to doing anything different from what predecessors have been doing for countless years before.

However, adverse conditions urged on designers to develop the various means now available for eliminating by far the greater majority of them to such an extent that, whenever a new station is to be established in the future, not only must the engineer responsible for its design give careful consideration to the choice of combustion equipment, but he is now well able to realise that the necessary refinements and developments produced in the past two or three years enable him to install this apparatus without the possibility of any one of the previously undesirable features being present.

Advantages.—Factors of important economic consideration which appear to have become general in all operating experience to date are :—

1. Removal from the combustion zone of all moving parts, which is a logical and progressive development.
2. Increased operating periods without interruption.
3. Unquestionable flexibility of the plant, which enables the load demand to be followed accurately.
4. Greatly decreased coal cost per kWh generated.
5. Effective control of combustion conditions, irrespective of load on the unit and grade of coal being consumed.
6. Reduction of overall maintenance of the plant.
7. Higher daily and annual operating efficiencies.
8. Increase of evaporative ratings.
9. Reduction of the space occupied, yielding valuable saving in capital cost.
10. Rapidity of raising steam to meet a sudden demand.
11. A definite advance on the labour conditions associated with operation.
12. The elimination of all banking losses.

Operation Results.—Four years' operating data show that the maintenance cost of the Derby plant (labour, boiler, furnace, pulverising, conveying, feeding, and burning equipment) has averaged 7.97d. per ton (30,844 tons pulverised in 1929-30); the operation cost (including power, average 23 kWh per ton) has averaged 18.53d. per ton; or a total of 2s. 2½d. per ton of coal consumed. Those figures have resulted in the reduction of the coal cost per kWh sold from 0.19d. in 1926 to 0.12d. in 1930; they reveal some measure of the progress made following the adoption of pulverised fuel and also emphasise the economic factors associated therewith.

The principal problems from the operating point of view have been connected with dust emission and ash. The gas-washing system now in use has overcome the early difficulties and once an effective use is found for the final ash deposit (a number of experiments for this purpose are being conducted) the whole of the original list of disadvantages will have been overcome.

It must necessarily be borne in mind that the coal which should be consumed so far as is possible is of a type which cannot possibly be utilised in any other way. When it is realised that from 83 to 88 per cent. of the available heat in this fuel is capable of being converted into potential energy, that large quantities are available, particularly in many of the provincial districts, then, economically, the use of pulverised-fuel is sound and is deserving of wider support.

Table I contains some of the results of a 24-hour test of the new plant now operating at Derby, which was conducted without special preparation; it indicates the ordinary daily efficiency and vindicates the economic value of the development.

* Appendix to the original paper.

TABLE I.—TEST RESULTS.

Boilers, two steaming, one stand-by.	
Coal consumed	135 tons 5 cwt.
Water evaporated	1,752,100 lb.
Water evaporated per lb. of coal	5.783 lb.
Net calorific value of fuel as fired	8,675 B.th.u.
Boiler plant efficiency	85.6 per cent.
Average drier output	5.01 tons per hour.
Boiler-house auxiliaries consumed	8,590 kWh.
Generating set, one	20,000 kW
Energy generated	159,000 kWh
Unit load factor	33 per cent.
Engine-room auxiliaries consumed	5,560 kWh, or 3.5 per cent.
Steam condensed	1,607,000 lb.
Steam per kWh	10.11 lb.
Coal per kWh	1.905 lb.
Fuel c.v. per kWh	16,526 B.th.u.
Overall thermal efficiency	20.65 per cent.

Capital Cost.—The development of pulverised fuel has been delayed on account of the increased capital cost associated with this type of plant. The installation at Derby was carried out in three stages; the first two boilers were completed in 1926, the next in 1928, and the last two in 1929-30. Basing the actual costs on quotations received for alternative types of plant and buildings, the increased capital cost for an equal volume of steam was some £20,000. At the end of the year 1928-9 the following information became available. The increased amount of electricity distributed in comparison with the previous year was 2,011,000 kWh, which, at an average price of 1.45d. per kWh sold, gave an increased revenue of £12,149 15s., while the reduction of the annual coal bill, as compared with the previous year, was £2,326, yielding a grand total of £14,475 15s. This, it is submitted, is not only a phenomenal return on the investment represented by the increased capital costs of the plant, but also an economic factor of such importance as to establish permanently the claims made for this development.

From investigations which have been made into available supplies, cost of transport, and location of plant, the balance in favour of establishing pulverised-fuel equipment in all large power stations appears to be economically, as well scientifically, sound. The establishment of the largest individual boilers in the world at East River station, right in the centre of New York, U.S.A., is not without some bearing on the economic factors associated with the pulverised-fuel development. It is well known that the cost of land in New York is dearer than the finest gold. Therefore, when considering plant extensions, tenders were called for designs incorporating the largest boilers which could be arranged in the limited space available. It is now universally known that they are in operation and have produced the almost incredible figure of 1,250,000 lb. of steam per hour. Such facts as these clearly leave very little argument available to dispute the fact that the development of pulverised fuel is of economic importance, and ensure, even though the capital cost may be, in special cases, slightly higher, a most valuable source of revenue, leading to reduced generating costs, in the author's opinion, irrespective of the location of the plant.

It will in any event be conceded that no other form of combustion equipment has permitted such rapid development, or could have been considered for operating boilers of such gigantic capacities. That the immediate future will offer possibilities for purchasing steam plant at greatly reduced cost is very fully borne out as the result of the cost of the most recent installation of steam generator at Derby.

Conclusions.—The average all round increase in boiler-house efficiency in municipal practice during the past three years is as much as 10 per cent. It is the claim of the author that the whole of this improvement in boiler-house practice is the result of the greater efficiencies associated with pulverised-fuel firing, or by the challenge which its introduction into boiler house operation has brought about.

The direct results of its application and development indicate that the design of future plant may closely define the following :—

(*a*) Increased capacity of boilers.
(*b*) Smaller and cheaper buildings.
(*c*) Partial de-sulphurising of gases and dust elimination as a continuous process.
(*d*) Continuous operating efficiencies of 86 per cent.
(*e*) Utilisation of fuels of a cheap character, which will keep the cost of generation uniformly low.
(*f*) Remote, automatic, and complete control under all conditions of load.

Discussion on Mr. Lake's Paper.

Mr. P. J. Robinson (Liverpool) did not agree that the only two methods were pulverised-fuel and stoker firing, and suggested that the method he proposed to adopt at the new capital station being built at Liverpool, *viz.*, a mixture of the two, was another. Stoker firing was to have superimposed on it pulverised-fuel firing, his reason being that he would be burning very much larger quantities of coal than was the case at Derby, and experience had shown that when a demand was made for coal for which ordinarily there was little market there was a distinct tendency for its price to rise. As regarded actual firing efficiency, the large combustion chambers of the stoker-fired boilers at the new section of the Lister Drive station (14 cu. ft. per square foot of grate area) showed little difference between them and the best pulverised-fuel firing. The boilers in question had 100 per cent. Bailey walls, constant CO_2 of 15½ per cent., and a firing efficiency of 86 per

cent. could be maintained. Pulverised-fuel firing had, however, been superimposed to obtain flexibility and also to obtain some control over the fuel market. He entirely disagreed with the use of sprays in the chimneys for dealing with grit and sulphurous fumes, because the weight of the moisture would bring the obnoxious fumes emitted down on to a very much smaller area. What should be aimed at was to prevent the emission as much as posible and to spread such as was emitted over as large an area as possible. It was calculated that it would be possible to get over the difficulty at Liverpool at a cost of approximately 6s. 8d. or 6s. 9d. per kW.

Mr. W. M. Selvey said that pulverised fuel was now well and fully born, and it was only a question of education as to the extent to which it would be adopted. At the same time, a great deal depended on the manner in which dust recovery and sulphurous-fume removal was finally settled. The author was at present first dry-cleaning the ash, then presumably putting the residuum (partly cleaned) through an exhaust fan, and then he pushed the gases through a spray chamber and up the chimney. At least three points in that connection required thorough discussion, namely, chimney and fan erosion by grit, then corrosion by washed gases containing sulphuric acid, and also the extremely sticky stuff that came through and was inclined to stick everywhere when the velocity dropped. As a matter of fact, the chimney was no longer to be regarded as something to do with draught in the old sense, but as a means for conducting comparatively cool gases to the atmosphere, and from that point of view the ordinary brick chimney was entirely suspect. The application of a certain cement mixture might be perfectly sound if used as a lining, and perhaps almost as successful as the more drastic use of chrome-steel. For the disposal of the slurry of the wet process, the author had borrowed from experience in dealing with copper and valuable metal slimes, and had developed apparatus which delivered anything the slurry contained in a form suitable for transport, at the same time leaving a filtrate which was practically crystal clear and could either be used for spraying or rejected into the river.

Mr. F. Forrest (chief engineer, Birmingham) said that for large plant pulverised fuel gave flexibility of control and also of choice of fuel, which was not possible with stoker-fired boilers. The equipment at Derby was of the bin-and-feeder type, but after considerable experience with it in Birmingham he did not regard it as the best type. Therefore in the latest installation at Birmingham they were going in for the "unit" system, and the same thing could be said of many of the large installations in America. The reasons were lower capital charges, lower maintenance, and greater flexibility of control; pulverised fuel should not be stored at all. Some American power stations had chimneys as high as 250 to 350 ft. above ground level. In this ocuntry they had too low chimneys, with the result that they had distributed their favours over too limited an area. It was only logical, having regard to the grid supply and the possibility of 50,000 kW being suddenly disconnected, that there should be an automatic governor on the boiler, as well as on the turbine, and experiments were being carried out at Birmingham in that direction. He agreed with Mr. Robinson that the method of dealing with dust and fumes at Derby was not the real solution of that problem. The time of contact between spray and particle was all-important; if the particle went to the spray below a certain velocity it would not be damped down at all. Moreover, the method was likely to lead to very severe corrosion of a mild-steel chimney, and also to the deposition of the condensed acid-laden vapour quite close to the generating station.

Dr. S. L. Pearce (chief engineer, London Power Co.) remarked that a great deal could be said on both sides, but it was impossible to dogmatise and say that pulverised fuel would be right in every locality and in every situation. There were situations where pulverised fuel was undoubtedly the right method, but equally there were situations where stoker firing was best. There was no difficulty in meeting the conditions with stoker firing with boilers up to 400,000 lb. evaporative capacity, but with larger boilers between that figure and 750,000 lb. and over, pulverised fuel should undoubtedly be used. As to the dust and fume problem, his company had been carrying out a great deal of research work for some 18 months. One report had been published by the Government, and it was quite possible that a further report would be issued within the next month or so. He would also be reading a paper before the World Power Conference next month in which that research work would be dealt with fully. He agreed with Mr. Robinson that the problem could be solved, but not necessarily by one method alone.

Mr. P. E. Rycroft (Messrs. Babcock & Wilcox, Ltd.) remarked that combustion engineers should ascertain which classes of fuel were most suitable for the one method and which were most suitable for the other; they must take a broad view of the whole situation. The Electricity Commissioners' statistics showed that no powdered-fuel station had yet approached within 3 per cent. of the efficiency of the best stoker-fired stations, which had a thermal efficiency of 21 per cent., whereas that of the best powdered-fuel station was 18 per cent. The higher steam pressures were not peculiar to pulverised-fuel firing and a thermal efficiency of from 80 to 82 per cent. was quite easy to obtain with stoker-fired boilers day in and day out, and not on special test. Moreover, the author was fortunate in that his station was in the centre of a coalfield, and to that extent his excellent figures could be said to be due to a geographical accident. It seemed that the average price of coal at Derby, delivered at the works, was a little over 8s. 6d. per ton.

Mr. C. G. Morley New (chief engineer, Cardiff) wondered whether the author would alter his views if he had to work in South Wales. There was undoubtedly good fuel in South Wales, but it was not cheap. There were cheap fuels (such as 1s. 6d. to 2s. per ton for anthracite duff), but by the time it was transported to Cardiff it was as cheap to buy local coal. It seemed to him that the author's argument that for an increased capital expenditure of £20,000 he had benefited to the extent of £14,000 was altogether fallacious. All that saving could not be attributed to pulverised fuel, because undoubtedly, as had been the case in his own works, there were improvements due to better utilisation and operation generally. In his own case there had been an increased output of 6,000,000 kWh in two years, and the generating cost had gone down by nearly £9,000, and something of the same sort must also have applied at Derby. For the same reason he estimated that in the year 1932-33 the total generating cost at Cardiff would be 11 per cent. lower than at Derby, and in 1934-35 about 8 or 9 per cent. lower.

Mr. R. A. Chattock said it was impossible to do pioneer work without spending money, and it was therefore unfair to compare the capital cost of pulverised-fuel stations as they stood at present with that of stoker-fired stations, which were, of course, on a permanent basis. In three or four years he believed pulverised-fuel plant would be as cheap as stoker plant, and have a higher efficiency. Three points emerged from the paper, namely, the necessity for simplifying the arrangements for pulverising and firing; secondly, more automatic control must be adopted (with pulverised-fuel equipment it was possible to cut down the number of attendants very materially and so save labour cost in operating the boiler house; three men could now do the work of nine men in a stoker-fired equipment, and he did not think that saving had been stressed sufficiently); thirdly, dust and sulphurous fumes would certainly have to be thoroughly threshed out. He did not agree that it was necessary to use evaporators to get the feed water perfectly clean and innocuous; steam-heated evaporators interfered with the general efficiency of the station. It was possible to purify the feed water by other means, such as softening, which allowed full use to be made of bled steam from the main turbine, and that was a better arrangement than using evaporators. He did not know of any station in this country in which pulverised fuel was used exclusively. There soon would be one, but until that time arrived it was not possible to compare thermal efficiencies. Nevertheless, although Mr. Rycroft had mentioned 21 per cent. for stoker-fired stations, at the Hams Hall station, Birmingham, 23 per cent. was obtained. That was not, however, entirely due to pulverised fuel, but to the method of operating the turbines in order to save as many heat units as possible and get them back into the boiler. At the time of the last trouble in the coalfields he burned pit-mound material, partly by stoker, but largely by the pulverisers, to the extent of 10,000 tons per week. It certainly was not coal, for it contained about 55 per cent. ash, but it was possible to burn it and obtain full evaporation in the pulverised-fuel boilers, whereas for the stoker-fired boilers it was necessary to mix it with 50 per cent. good-class coal, and then the boilers only gave 75 per cent. of their output. In that way he was able to save the situation in Birmingham, and did not buy an ounce of coal outside the country.

Mr. G. H. Lake, replying to the discussion, said there was a station working in this country on a large scale in which the combination of stoker- and pulverised-fuel firing suggested by Mr. Robinson had been in operation, but quite recently the whole of the stoker portion of the plant had been closed down, and now the station was running entirely on pulverised fuel. He did not know of any stoker-fired plant in this country which gave the same high order of efficiency, continuously, as was given by pulverised-fuel plant. Experiments were being carried out, and he had every confidence in being able eventually to incorporate a dust catcher with water sprays. During nine months at Derby there had been no complaints with regard to grit and fumes. The brick chimney was lined with a special kind of cement for about 30 ft. up and, as the water sprays were 30 ft. up the chimney, he had no doubt that the moisture absorbed practically all the ash. In Germany, at Mannheim, there were some interesting applications of automatic control which were well worth inspecting. In connection with the grid scheme he visualised, not only large units, but possibilities of very considerable variations in load, which stoker-fired plant would not be able to cope with as rapidly as could pulverised-fuel plant, whilst another feature must be ability to deal with all grades of coal and still maintain full evaporative capacity. He did not regard 400,000 lb. evaporative capacity as the lower limit of size for the use of pulverised fuel. Mr. Rycroft's figures referred to a period during which the Derby station had been working with 35 per cent. of stoker-fired plant.

Mr. A. Nichols Moore (chief engineer, Newport, Mon.), in proposing a vote of thanks to the author, mentioned that at Newport two months ago a test of stoker-fired boilers of a capacity of 60,000 lb. showed a thermal efficiency of 87.54 per cent. Combined stoker- and pulverised-fuel firing had been adopted at Newport in order to obtain flexibility of control in relation to the fluctuations caused by a rolling-mill and steel-works load; in addition to better control, it was noticed that the overall efficiency slightly improved when the pulveriser booster was in use.

The Electric Heating of Buildings.

(Abstract.)

By J. W. Burr, M.I.E.E., M.I.Mech.E.
(Borough Electrical Engineer, Swansea.)

THE author recently prepared a report for his Municipal Council on "The Engineering Requirements for a New Mental Hospital" as the outcome of several years' investigation of the possibilities of heating public buildings. The two principal points dealt with were (1) the supply of electricity to the hospital for lighting, power, cooking, &c., and (2) the generation of heat for water and steam.

The architect's specification dealt with the provision of boiler plant and reciprocating steam engines for generating electricity, the exhaust steam therefrom to be utilised for such other purposes as warming the buildings and providing hot water for domestic draw-off purposes. As the heat available for producing electricity and for warming purposes would be approximately in the proportion of 34 to 966, if the whole of the heat in the exhaust steam could be utilised for other services the combination would be most efficient. The supply of electricity at an economic price in order to avoid the installation of back-pressure engines would fortunately not be difficult on account of the extra cost of labour required by the generating plant. The heating problem, however, was not quite so easy to solve. Steam was required for laundry and cooking purposes during daylight hours, but hot water for warming the buildings and for the domestic supply was required throughout the twenty-four hours. At the outset the author was not convinced that electricity could be used economically to heat the hospital and for the other services, but after going carefully into the matter he changed his mind and has attempted to express in this paper his train of thought in dealing with the problem.

Direct electric heating is a method with which we are all familiar. The building is wired throughout and "fires," convectors, or radiators are placed in suitable positions. From the consumer's point of view the method has generally proved to be more or less expensive, according to the local heating tariff, but has made great strides on account of its comfort, convenience, and cleanliness. From the supply authority's standpoint the load was always considered to be very desirable and strenuous efforts were made to obtain it, for it was considered that it would materially assist in improving the load factor, but experience has shown that this is not always the case. In one particular undertaking 4,000 kW of electric radiators was obtained, but, since most of them were used in public buildings, they came into commission between 9 a.m. and 12.30 p.m., and 2 and 6 p.m., and synchronised with the peak load. The net result was to raise the peak load without any appreciable effect upon the off-peak period. The valleys in the load curve consequently became deeper. With the effect of radiator load upon his last year's peak load still fresh in the author's mind, their installation with immersion heaters did not appeal to him, and he therefore considered that an economic price for electricity could not be offered to the consumer for that class of load.

Indirect electric heating is really a modification of the familiar central-heating plant, inasmuch that the actual distribution of heat is effected by some other medium, usually water. The generation of the actual heat in the boiler, however, may be effected in various ways. Resistors are only practical at low or medium voltages; the system is not, strictly speaking, a boiler installation. Electrode boilers, wherein current is supplied to electrodes immersed in the water, have been constructed for voltages up to 30,000. Like many other engineers, the author had serious doubts with regard to the earthing of high-voltage electrode boilers. Tests carried out show that the earth current is negligible.

Last year the Electricity Commissioners were approached with a view to securing an amended form of Regulation 3 of the "Regulations for Securing the Safety of the Public," so as to admit of an e.h.p. supply being given to any premises. The author understands that the Commissioners have now agreed to the words "or except for the purposes of thermal-storage installations" being inserted in the paragraph in question. A further condition imposed by the Commissioners upon the supply authority is that all metalwork enclosing, supporting, or associated with the consumer's installation, other than that designed to serve as a conductor, is, where necessary to prevent danger, to be efficiently earthed.

Complete automatic operation is a workable proposition and the labour is reduced to the control of temperature alone, which would be done by the person who normally regulates the temperature in any central-heating system, usually the caretaker. Since the supply would be switched on at a predetermined hour from the generating station, automatic devices are required to ensure safety and efficient operation, *i.e.*, thermostats and an earth-leakage relay operating the main switch. Such plant can be safely left unattended during the loading periods, generally 10 p.m. to 6 a.m., and an alarm bell placed in the caretaker's quarters will warn him of the stopping of the plant for any reason other than normal operation. The author can state definitely that the insurance company was willing to accept as ordinary risk the insuring of electrode boilers working under the foregoing conditions.

Returning again to the problem of heating the hospital referred to, the two main methods available are (1) to install coal-fired steam boilers, and (2) to install electrically-heated boilers, the electricity being obtained from the public mains. Comparison of the capital costs of the two systems showed that there was little difference between the two types of plant. The erection of a stack is a costly procedure, but thermal-storage vessels are usually placed below the sub-basement level and therefore occupy no useful building space.

It must be emphasised that as the electrical method would probably mean separating the plant into two separate sections, one for the storage of steam required in the kitchen and laundry, and the other for the storage of hot water for warming the building and for domestic supply purposes, there would be no calorific losses. As the steam and hot-water plant could be placed as near the centre of distribution as possible the heat losses would be reduced to a minimum. It is found in practice that less heat is required by the electrical method than by the less flexible coal-fired plant, due to ease of regulation and automatic temperature control. In some cases there has proved to be an actual margin in favour of electricity equal to 32 per cent. of the estimated energy consumption; 20 per cent. was regarded by the author as safe. Labour charges will be heavy with the coal-fired plant, whereas with automatically-operated electrical plant they will be very small.

Calculations made in the manner described do not always reveal the true aspect of the situation, as certain additional charges should be added to the coal-fired scheme; for instance, there will be no deterioration of stonework and buildings generally, due to the condensation of smoke and formation of dilute sulphuric acid, and less cleaning and decorative renewals. As the hospital in question is situate some distance from public highways, the cost of the maintenance of private roads had to be taken into consideration. After taking everything into consideration, however, an extremely low charge had to be made for electricity before electrode boilers could compete with the coal-fired plant. In considering this class of load regard must be had to so many varying factors that the author cannot convince himself that it is possible to standardise the methods of charging for electricity used for heating different types of public buildings.

Assuming an installation of electrode boilers that would generate heat during off-peak hours, it being accumulated in thermal-storage vessels until needed, with control of the supply in the hands of the generation staff, who would use the consumer's load to even up the valleys in the station's load curve, one has to consider (i) the capital expended on providing the special supply, *i.e.*, on switchgear and cables between the station and the consumer; (ii) direct profit from the sale of energy; and (iii) indirect profit from the increase of thermal efficiency.

Items (i) and (ii) are self-explanatory, but in the case of (iii) the direct profit increases as load increments occur, while the indirect profit becomes less, but the total profit remains constant. Therefore the B.th.u. loss per kWh generated per day depends solely upon the load factor and hence, knowing the price and calorific value of the coal at any particular station, the loss in pence per kWh generated per day may easily be calculated for various load factors, and the direct and indirect profit accruing from the sale of energy.

The method outlined in the paper is not intended to be complete, but is merely a suggested method of attacking the problem of tariffs for the particular load in question. In his calculations the author has only considered the coal costs and it is admitted that other factors enter the question, wherefor these problems can only be attacked by persons knowing the actual load conditions. The author is therefore of the opinion that the actual coal cost per kWh is a fairly safe basis on which to calculate for off-load heating in large amounts. One of the difficulties with which one has to contend is the adoption of a coal clause which will be mutually satisfactory. The author has in mind the general strike and the prolonged coal stoppage of 1926, when the price of coal went up to unthought of heights, and the calorific values of some coals were exceedingly low. In such an event, of course, the consumer has to pay heavily for energy consumed, but it must be remembered that if the consumer had his own coal-fired plant his coal cost would probably rise even higher in proportion than the cost of coal to a supply authority.

Briefly stated, the conclusions arrived at in the paper are as follows:—It is not possible to offer a tariff to prospective consumers which will bear direct comparison with the cost of alternative systems unless all the advantages and economies mentioned in the paper are taken into account. Little difficulty should be experienced, however, in justifying rates of from 0.2 pence to 0.3 pence per kWh. It is suggested that it is not feasible to standardise methods of charging for electricity used for heating large public buildings; each case must be considered on its merits and under local conditions.

There is no question that the matter should be undertaken seriously and with vigour. Consumers should be approached before building operations, or even plans, have been commenced.

Due regard must be given to all aspects, such as direct profit, indirect profit, and the general advancement of the undertaking. The potential load from this class of heating is tremendous.

The author expresses his appreciation of the help of his personal assistant, Mr. H. A. Haines, B.Sc., in the preparation of the paper.

The Exhibits at Eastbourne.

(*Concluded from page* 1022.)

Further notes and illustrations relating to some of the principal items which were displayed by manufacturers and representative organisations.

IN our last issue we briefly referred to a particularly interesting development in domestic electrical apparatus, namely, the **British Standard Cookers** which have been produced co-operatively by nine manufacturers to the specification of the Electrical Apparatus Sub-Committee of the

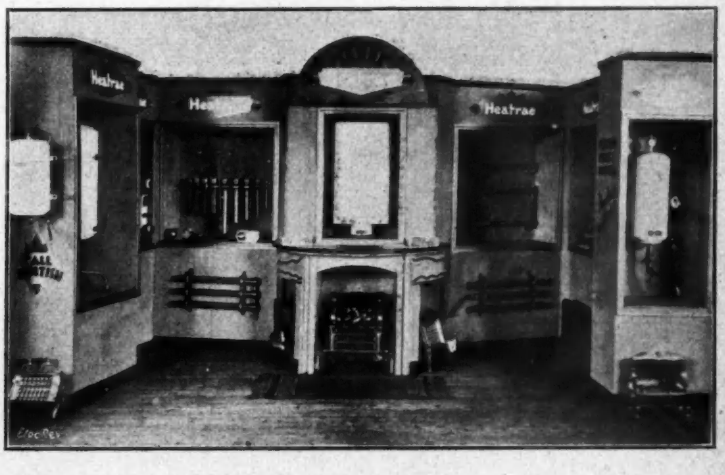
A British Standard Cooker.

I.M.E.A. B.S.C. are made in two sizes, one for families of up to six persons, and one to serve for eight persons, and the following notes are taken from the specification covering these models. The overall and oven cooking-space dimensions of the smaller cooker are, respectively, width 27½ in. and 12¾ in.; depth 28 in. and 13 in.; and height 59 in. and 14 in. The corresponding dimensions of the larger model are 29⅝ in. and 15¾ in., 28 in. and 16 in., and 59 in. and 14 in. Every part of the cooker is standardised and replaceable from stocks immediately. The ovens are provided with side and bottom heat; three elements are used—one at each side and one at the bottom. In the case of the smaller model each element is loaded to 700 watts, and in the large model to 850 watts. When switched to "medium" a half section of each element is fully active; all the elements in series at "low" represent quarter full load. The porcelain-enamelled oven interiors are rounded at the corners and can easily be withdrawn. The ovens are each fitted with detachable shelf runners, a roasting tin, two grid shelves, and a browning sheet. Two 8-in. circular, totally-enclosed hotplates are fitted in each model, 1,600 or 1,800 W, arranged for 3-heat control, and in the larger model a third additional plate, 6½ in. diameter, 1,000 W, is fitted. These plates are mounted on a rigid base which allows for easy adjustment of height or level without the use of screws. The grills are each fitted in the large hot cupboard between the oven and the hob, and are controlled by 3-heat switches which, when turned to "medium," leave the centre portion of the grills on. The grill pans are removable when the cupboards are required for warming plates, &c. A white-enamelled removable crown tray is supplied in each case.

The wiring throughout is of the simplest. Under the hob an insulated channel carries the terminal block serving one boiling plate and grill, and leads the cables into the wiring chamber on the right-hand side of the cooker. The wires from the second boiling plate pass directly into the wiring chamber, while a refractory block carrying the necessary three terminals gives communication between the oven element space and the wiring chamber. The latter is completely detachable from the cooker as a unit by removal of three screws and disconnection of the wires serving the oven, grill and boiling plates. An individual switch can be replaced without disturbing any wiring except that connected to it. Fuses are mounted on a base that provides a universal fitting, and all types of fuses now generally used on cookers can be fitted without alteration. The companies which have co-operated to produce B.S.C. are Berry's Electric, Ltd.; the British Electric Transformer Co., Ltd.; Credenda Conduits Co., Ltd.; the Falkirk Iron Co., Ltd.; the General Electric Co., Ltd.; the Hotpoint Electric Appliance Co., Ltd.; the Jackson Electric Stove Co., Ltd.; Revo Electric Co., Ltd.; and Siemens Electric Lamps and Supplies, Ltd.; and each of these firms had a model B.S.C. displayed on its stand.

Messrs. Sadia, Ltd., had an interesting display of automatic electric water heaters, including some of the pressure type, others self-contained with a ball tank, and some with a novel anti-drip device. Some new-type "Sadia" table stoves were also seen on this stand, as were also thermostats, time switches, immersion heaters, and heating pipes. A feature of the exhibits on this stand was a new model of the company's water heater which has a central outlet tube which slides up and down. An anti-drip device is also a new point in connection with this apparatus.

The "Heatrae" exhibit of **Electric Fires, Ltd.,** was confined to a few typical examples of the leading lines of heating apparatus made by that firm. Several types of thermal-storage water heaters were exhibited in such a way that the construction could be examined. A cistern-type tank which was shown contains its own ball-valve chamber, and works on the principle of constant temperature and variable volume. This is a complete hot-water system in itself, and is suitable for direct connection to a cold-water main. An example of a 10-gal. thermal-storage water heater that can be operated either as a displacement-type heater, or connected



The Stand of Electric Fires, Ltd.

to a ball-valve tank and piped to several points, was also shown on this stand, as was a new type 1½-gal. thermostatically-controlled heater which has been designed specially

for sinks and wash basins. Several new developments in "Heatrae" hot-pipe systems were also a feature. Other "Heatrae" apparatus disp.ayed included low-temperature air warmers, warming plates, towel rails, immersion heaters, and electric fires. Three examples of the last-mentioned were shown, including the "Cairo" pattern imitation coal fire with a very attractive smoke and flame effect. The other two were the "Corona," which has a specially-designed copper reflector that closely emulates the rising sun; and the "Adam" pattern, embodying the solid porcelain-type "Heatrae" fire bar.

The predominant note of interest at the stand of **Carron Company** was a range of cookers with both side and bottom, and top and bottom, oven heating. On the "M," or side and bottom heated, series more than usual attention has been paid to the production and insulation of the boiling-plate leads under the hob. The covers giving this protection are incorporated with the flexible three-pin plug assembly which is fitted to each "Sadia" boiling plate. A point of interest is the thought that has been devoted to the draining of spilt liquids, which are led through slots and holes in a diaphragm under the plate to the white-enamelled plate which extends half-way across the top of the grill chamber or warming cupboard, so that spilt liquids do not fall into the warming chamber or on food placed there. One rather striking model of this class of cooker is finished in celeste blue and white enamel. In the "P"-type cooker (top and bottom heating) the keynote is again the attention which has been paid to accessibility from the maintenance engineer's point of view. All component parts, *i.e.*, boiling plates, grill, and oven elements are of the plug-in type, and the makers claim that any person capable of using a screwdriver may withdraw, examine, and replace the grill complete in 75 seconds. Either the top or bottom elements may be inspected in one minute. Mention should also be made of the thermal automatic kettle and vitreous-enamelled irons and fires displayed on this stand, as well as examples of chromium plating. The main feature of the kettle is the patented auto-thermal-switch which precludes the possibility of the kettle boiling dry. The switch may be operated manually in addition to its automatic feature. The new irons are finished in delightful pastel colours reproduced by the company's recently-installed process of liquid vitreous enamelling.

The **Jackson Electric Stove Co., Ltd.,** had its usual excellent and comprehensive exhibit of cookers, including the latest developments of the popular "Junior" models in mottled-enamel finishes, and also the table cooker. Our attention was attracted by a range of "Jackson" vertical-element fires which are available with one, two or three 750-W elements. These fires have some attractive finishes in mottled enamel.

Venner Time Switches, Ltd., had a special display of apparatus for the control of "off-peak" electric water heating. A "W" relay (a.c., 10 A) is designed to control electric water heating in conjunction with street lighting. When the street lights come on the water heaters in adjoining houses are switched off, and the heating supply is resumed later when the evening load peak is over. The relay is in no way affected by the extinguishing of the street lights. The "ewNZX" switch (a.c., 10 A) is fitted with a "Venner" standard electrically wound clock, and has three pairs of hands, giving three switchings on and off per day. When fewer switchings are required the hands may be superimposed. This switch is particularly useful when three distinct peak periods occur during the day. On this stand there was also a range of thermostats for controlling electric water heaters. Four sizes were shown, of 6-10-, 15- and 20-A capacity, fitted with specially high-grade mercury tubes, the whole design being very simple and compact. If desired a neat case can be supplied to enclose the apparatus. A special all-metal thermostat for small currents up to 1 A, a.c., is also on show. Another "Venner" exhibit, the "QZM" switch for two-rate tariff and maximum-demand indicator purposes, is designed to operate the resetting coils of "Merz"-type demand-indicators. It is fitted with the makers' new "Quick-Stop" motor which is electrically-driven, without spring storage, and stops in a second or so if the supply is cut off, restarting when the supply is resumed. The time over which the demand is measured is always the standard period, irrespective of whether the supply has been interrupted in the interval or not. A prepayment meter for electric radiators in hotel bedrooms is another feature of this display. Any number of coins up to ten may be inserted, the number unused and the total number inserted being shown on the dial. The price per unit may be easily changed, and the hotel proprietor may reset the apparatus to zero when the apartment is vacated.

"Venner" Domestic Control Unit; Three Daily Switchings.

In addition to displaying a "Radiovisor" lighting unit automatically controlling a street lamp, **Radiovisor Parent, Ltd.,** gave a separate demonstration of the a.c. lighting unit working in conjunction with a contactor switch, breaking a current of 15 amperes. A feature of this exhibit was an acoustic demonstration which was specially arranged to show the response of the "Radiovisor" light-sensitive bridge to variations of light at sound frequencies, so demonstrating the quality of reproduction obtained by talking-picture equipment employing the "Radiovisor" bridge. The bridge was connected as in ordinary talking-picture practice to an amplifier and loud-speaker, but instead of being operated by a sound film record, it was, for the sake of simplicity, operated by a fluctuating beam of light from a Neon lamp, which was controlled by a gramophone pick-up.

"Radiovisor" Pin-type L.S. Bridge.

Included in the display by the **Dowsing Radiant Heat Co., Ltd.,** was a cordless electric ironing outfit for use in dressmaking workrooms, public wash-houses, training schools, &c.; a few samples of laundry irons, including a new large pattern 35-lb. machine iron; a special bench iron in which the material is moved on the polished and heated surface, as distinct from the usual method of ironing; and an electrically-heated instrument steriliser, fitted with the maker's new float-system protective device, which is so arranged that a circuit breaker is operated when some predetermined level of the water has been reached, say, the last ½ in. On the "Dowsing" stand were also seen an electrically-heated branding machine and some electrically-heated clothing (waistcoat, gloves, and soles), suitable for airmen's wear, while an outstanding feature was a new folding-pattern "Solarium" electric light cabinet bath for home use.

The **Hotpoint Electric Appliance Co., Ltd.,** displayed a series of the latest "Hotpoint-Falco" cookers, including models suitable for from 3/4 persons up to 10/12 persons. They were all vitreous-enamel finished. The "Hotpoint-Maytag" electric washing and wringing machine was shown in operation. This machine operates on the gyrator principle and ensures a very rapid washing of the clothes, so that no hand rubbing is necessary. The machine occupies a floor space of only 25 sq. in. The electric ironer, which was also demonstrated, can be attached to the washing machine by simply removing the wringer from the post and putting the ironing attachment in its position. The "Hotpoint Super-Automatic" electric kettle was the subject of special demonstrations. This kettle is made in 2- and 3-pint sizes, the latter having a loading of 1,000 watts. The "Hotpoint Premier-Duplex" and "Premier-Junior" electric vacuum cleaners were also to be seen on this stand.

On the stand of **Messrs. Drake & Gorham, Wholesale, Ltd.,** a special feature was made of "Inventum" off-peak water heaters with time-switch or relay control. By means of an electro-magnetic valve, housed in the cold-water chamber, when the "special tariff" period ends cold water is cut off, leaving a reservoir of very hot water for use during the day. The heaters range in capacity from 5 to 55 gal.

"Inventum" gravity-feed type cisterns in capacities of from 4½ to 55 gal. were also shown, as were 1½-gal. domestic cisterns of the same make. The latter are specially suitable for use over sinks, and in offices, garages, surgeries, &c. They are each fitted with chromium-plated straps and a swinging outlet spout.

The "Inventum" barber's cistern was also displayed. All the water heaters are thermostatically controlled, and are fitted with easily removable interiors for cleaning purposes. Other features on this stand were the "Metesco" oil switch-fuse, an e.h.p. ring-main controller which condenses in a minimum space the maximum amount of control for heavy-current ring mains up to 12,000 volts, and a recent introduction known as the type I.E.P. (interrupts every phase) automatic oil switch-fuse, which is so designed that a fuse blowing in any phase brings out the whole switch.

The "Busy Bee" refrigerator was also displayed by Messrs. Drake & Gorham.

A feature of the **Eastbourne Electricity Department's** stand was a model of the revolving turret bus-bar sub-station metal-clad oil switch which is being installed at Eastbourne to control the 11-kV grid supply.

The Bastian Meter Co., Ltd., whose display occupied the Indian Pavilion (Devonshire Park), showed a 200-kW "Mascarini" electro-steam boiler, the working of which indicated the rapid speed with which steam can be generated. It is of interest to note that three of these boilers have been installed in what is believed to be the largest poultry farm in the world. There was also a good show of "Bastian" electric water heaters of different types, particular attention being paid to the 1½- and 2-gallon models. These heaters are of the displacement (push through) type, very efficiently lagged, and are attractively finished in the latest white cellulose. The heaters are thermostatically controlled, and the elements and thermostats are guaranteed for two years, the complete apparatus being guaranteed for a period of twelve months. Besides new models of fires and radiators shown by this company, there was a very good line of both single-temperature and adjustable a.c. thermostats.

Burnley Components, Ltd., had a special display of the most popular types of "Burco" electric wash boilers, the finish to which renders the boilers very attractive. Two new features include a new type draw-off tap joint, and an improved high efficiency element-clamping arrangement. This company's latest product, the "Burco" competitor model electric wash boiler was also featured. This is an eight-gallon boiler with a galvanised outer casing and a tinned-copper pan, complete with cable, control switch and pattress, with or without a draw-off tap.

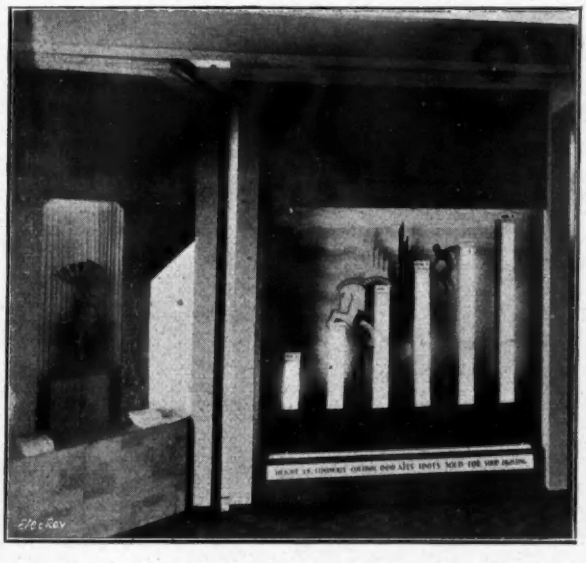
On the stand of **Domestic Electrification, Ltd.,** was displayed a range of "Dolphin" heating and cooking appliances, including a standard cooker embodying all such modern requirements as mottle-enamelled hob, and all-mottled-enamelled oven interior. Ample space has been provided round both the oven and door for lagging. A new design of door latch with a heat-resisting handle ensures a perfectly tight-fitting door; the elements are of the plug-in type, and the boiling plates are of the solid, circular pattern. On a smaller model there is a small boiling plate suitable for dealing with small quantities of liquid. The oven elements in this model are at the top and bottom, and a solid shelf is provided to allow the oven to be subdivided, so that when only one dish is being cooked, only one element need be used. For compactness and convenience in this small model too, the grill has been placed at the top of the oven, so permitting ample space for plate warming in the bottom. The No. 616 cooker has been designed for the family of from 6-10 persons. It has ample oven space, two large circular boiling plates, and a grill. A let-down door provides a hot cupboard for plates under the hob. The "Dolphin" fires are of very pleasing designs; some of the models have the elements placed vertically, with chromium-plated reflectors, thus combining the "upward" heating effect of reflector-type fires, but with increased efficiency. Another feature was the "Dolphin" automatic safety iron, with a "Klixon" patent thermostat, which was shown for the first time. The thermostat automatically switches both "on" and "off," so that a correct ironing temperature is always maintained. A very ingenious working model of this thermostat on the stand was interesting to watch, and it showed the quite positive action and robust construction.

The Eastbourne branch of the **Electrical Contractors' Association** had a creditable display of electrical equipment, including "Bulle" clocks, sundry fires, kettles and other small domestic appliances, the "Connor" washer, "Claco Suburban" cooker, "Savage" health motor, and artificial sunlight lamps. A feature of this display was a large cake which had been electrically baked by the Scotch Bakery, Eastbourne, and which was to be raffled for the Eastbourne Hospital. Considerable interest was attached to some a.c. to d.c. changeover switches shown by Messrs. Miller & Salmes, Ltd., on this stand. The equipment consisted of G.E.C. ironclad switches controlling Igranic automatic gear.

Messrs. Sigg, Ltd., had a display of "Siginflex" electric cooking utensils, which have ¼-in. thick machined flat bases, on the E.C.A. stand.

Messrs. George Nobbs, Ltd., had an interesting display of automatic temperature controls for rooms, tanks, ovens, &c., including their latest "M"-type automatic temperature control thermostat, which comprises an all-metal, single-unit thermostat having an expanding sleeve operating a single-pole contactor switch with a magnetic blow-out, the whole being mounted as one unit. Being all metal, and having no glass tubes, it is less likely to be damaged in transit. Furthermore, it can be used at any angle, and occupies a very small space. The control is made under Maclaren patents. Other items seen on this stand are controls for oil-burning equipment, and an automatic temperature-controlled hot plate, incubator, and steriliser, in addition to a new form of lagged "B.S."-type water heater, with automatic temperature control, and examples of automatic hot-water calorifiers made in 5- to 50-gallon capacities, with current loadings to suit requirements. The calorifiers comprise high-pressure copper containers, tinned inside and lagged with average of 3 in. of cork insulation. Each calorifier is provided with an immersion heater and an automatic temperature control, single-unit switch, with a magnetic blow-out for operating up to 20 A, a.c., or 10 A, d.c.

As indicated in our last issue, and depicted in the illustrations accompanying this article, the **Electric Lamp Manufacturers' Association** had a display of variable sign lighting and fascia lighting. The increase in consumption per consumer for shop lighting in a suburban shopping district was shown by luminous columns, year by year, from 476 kWh in 1919 to 2,068 kWh in 1929.



Portions of the Exhibit by the Electric Lamp Manufacturers' Association.

Among a range of water-heating appliances shown by **Messrs. George Green & Co.** were an immersion heater fitted with an automatic cut-out so that it cannot be operated under "dry" conditions, a wash boiler having a loading of 2,500 W and a water capacity of 8 gal., and a thermal-storage off-peak water heater fitted with a thermal-trip which ensures that cold water cannot enter the tank when the time switch is "off." Another "Green" exhibit was a "Fool-proof" wash boiler equipped with an immersion heater of the type described above.

The General Electric Co., Ltd., was represented at two stands of the Exhibition. One stand was devoted entirely to water-heating equipment, and on it were shown a model of an installation incorporating a general hot-water supply to a home by means of a "Magnet" electric storage water heater, and a range of standard water heaters of from 1½- to 30-gal. capacities, thermostatically controlled. G.E.C. low-temperature radiators, both of the tubular and convector types, were also shown, in conjunction with thermostatic-control equipment. The second stand was subdivided into two sections, one section being devoted to illuminating engineering, and street-lighting in particular, and the other to household electrical appliances. The principal feature of the lighting section was an ingenious mechanical device which is capable of being operated in such a way that lighting engineers are able to judge illumination effects in thoroughfares under a variety of conditions. Modern street lighting as applied to wide or narrow streets, whether straight or curved, with a comparison of lighting intensities, was shown in a novel as well as a most instructive form by this device. The lighting

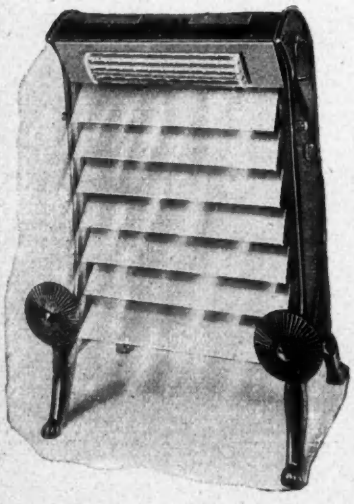
is based on the proved illuminating efficiency of "Wembley" lanterns, a number of which were displayed. The household appliances section embraced a number of "Magnet" standard cookers, and a representative display of other cooking appliances and general domestic service electrical goods made by the company. Among the last named were cast-iron fires, a floor polisher, a health motor, stand- and wall-type towel rails, curling-tong heaters, a new quick-boiling kettle, and irons with coloured domes. A number of the "Magnet" appliances enumerated were also displayed by the Eastbourne supply undertaking and contractors. In a showcase outside the G.E.C. stand examples of "Pirelli" oil-filled cable were displayed, contrasted with a short length of the original Ferranti cable.

One of the General Electric Company's Stands.

The Revo Electric Co., Ltd., had an interesting display of cookers, fires, washboilers, waterheaters, &c. The cooker has been considerably improved since last year, a special feature being the enclosed heating elements used in the oven. These are of the plug-in type with a new patented plug and socket, so arranged that perfect contact is given, while at the same time they are so easy to fit that a smooth action is obtained. The cooker is of all-vitreous-enamel finish with white door panels. Some of the new vitreous-enamel finishes on the fires are very handsome indeed, especially the "Rainbow" finish. The "Matchless" fire, one of the latest designs, has quite a new element, which illuminates the reflector uniformly, even when it is switched on to "low." The new "Revo" chromium-plated iron, with a brilliant finish, is attracting a good deal of attention.

The following items were included in the display of the **Edison Swan Electric Co., Ltd.**: street-lighting and flood-lighting equipment; electric fountains; "B.T.-H." electric refrigerators; "Thor" washers, ironers and vacuum cleaners; electric domestic appliances; cables and house-wiring systems; and radio apparatus.

Metro-Vick Supplies made a feature of their automatic kettles and new cast-in boiling plates. An 8-in. plate produced by the company is claimed to be the only one of its size in existence with a loading as high as 2 kW. Under test a pint of water was observed to boil from cold in slightly over 5½ min.



A New "Tricity Sunray."

The British Electric Transformer Co., Ltd., had two stands at the exhibition, one devoted to "Tricity" cookers, fires and irons, and "Kye" electric lamps, &c., and the other was a "Sunray" lounge, exhibiting "Tricity Sunrays." Two new "Tricity" cookers shown were a new "baby" cooker, the "Tricity Tot," and an intermediate-size cooker called the "Tricity Tweeny." A new design of average-size domestic cooker with a third boiling plate and other modifications was another feature, as were also several attractive models of coal and reflector-type fires, together with other domestic appliances, including the new "Sunray Tricity" iron, &c., on the domestic stand. Several new models of "Tricity Sunrays" were exhibited for the first time in the "Lounge." No. 757 is designed to enable the user to lie down in front of it and obtain the full benefit of the "sunrays." The reflector is of polished-copper finish, and the case is of black nickel. A new feature is the inclusion of a radiant element of 1,600 watts capacity, fitted along the top, which is controlled by a separate switch. This model is also fitted with five 200-W "Sunray" lamps. It is 30½ in. high, 20 in. wide, and 14 in. deep. Model No. 766 "Sunray" is fitted with three lamps and a 1,000-watts element, the latter controlled by a switch on the side. The reflectors are of polished-copper finish, with a black frame. The dimensions are 22½ in. high by 17 in. and 11 in. There is an alternative design to the model No. 766, namely, No 765, which is fitted with only two lamps and a 1,000-W element.

In addition to new "Magicoal" fires **Messrs. Berry's Electric (1928), Ltd.,** showed examples of the new "Canvary" electric water heaters which incorporate the following features: the thermal efficiency is very high, the inner cylinder being suspended within highly efficient insulating material, and in no way metallically connected with the outer case; the heaters are entirely automatic, being controlled by a simple yet accurate thermostat, designed to operate without the use of springs, and suitable for both a.c. or d.c.; the element is of solid construction, with a large heating surface; there is a non-drip device; an advantage which will appeal to the housewife is the fact that water of any temperature from scalding to cool can be had by merely moving a lever; easy access for cleaning purposes is provided; the element and thermostat are removable without emptying the tank; the outer case is finished in cellulose enamel, with coloured bands to tone with surroundings. The heaters are made in sizes from 1½ to 22 gal.

Messrs. J. H. Tucker & Co., Ltd., showed 20 different types of their cooker control units, ranging from small units for "baby" cookers to large ones designed for cookers having loadings as high as 6 kW and to serve 8-10 persons. The actual number of types of these units produced, taking into consideration the finishes available, *i.e.*, green, white, or mottled enamel, is well over sixty. A recent "Tucker" production has the pilot lamp mounted inside the case, and is visible through a red or white bull's-eye lens. Certain types can, in addition, be fitted with "Zed" fuses and Edison screw lampholders, if required. A new line shown was a 15-ampere skeleton-type heater switch with a footpress dolly. The contact clips, mechanism, &c., of this are mounted on a steel frame, and no porcelain is employed. The contact clips and contact arm are insulated from non-conducting metal with mica, and all switches are subjected to a flash test of 1,100 volts a.c. The mechanism embodies a complete positive drive, both when "making" and "breaking" the circuit. The moving-contact arm is a separate part from the rocker, and at the commencement of the stroke it is directly operated and slightly displaced by the operating dolly prior to the dolly actuating the rocker. This results in the positive drive being effective throughout the stroke of the operating dolly. The whole of the conducting parts of the switch are very robust, and the steel frame, rocker and bridge are galvanised. The spring is of the compression type in steel, copper-plated to prevent rusting. The operating dolly incorporates a long straight shank designed particularly for foot operation, with the minimum effort, particular consideration being given to avoid the possibility of "tipping" the fire when operating the switch. The full-rated load test of 15 A, 250 volts, d.c., has been carried out for 32,270 operations (on and off), without electrical or mechanical damage. The switch action is par-

New "Tucker" Heater Switch.

ticularly smooth, and therefore perfectly suitable for hand operation. The scope of its suitability is not confined to heaters.

The exhibits by **Messrs. Bulpitt & Sons, Ltd.**, included electric kettles, thermal-storage tanks, coffee percolators and 2-heat elements, bowl fires, electric irons, immersion heaters, electric steamers and tea urns, and flat-bottomed utensils for hot plates. Nearly all these items showed improvements on their forerunners. The bowl fire has an 11-in. dia. reflector, and an improved method of attaching the element is adopted; it can now be supplied in chromium plating. The flat-bottomed utensils include a new method of securing permanent flatness. The bottoms are ¼-in. thick, and are produced from material treated to eliminate stresses. The side walls of the utensils are of much thinner-gauge material to reduce both weight and cost. Special "Bulpitt" exhibits were modern water heaters of the storage type, calling for light loading spread over considerable periods. The loading of the 10-gal. size heater is 0.75 kW, while the loading of the 15-gal. tank is 1 kW. The temperature is adjustable by the thermostat setting, and it can be varied between 120 deg. F. and 200 deg. F. An immersion heater of an improved and particularly robust type is employed, worked at a relatively low heat to ensure long life. It can be renewed by the simple operation of releasing the element from its containing tube, by turning a cap with a bayonet joint, which allows the porcelain former and heater to come away bodily without breaking any water joints. Another feature of considerable utility is the means adopted for obtaining a small quantity of hot water almost immediately the heater is switched on. The pocket containing the heating element is surrounded by a somewhat larger cylinder, the top of which is open and immediately under the hot-water outlet syphon. The bottom of this cylinder is perforated, and the small volume of water which enters it is immediately raised to a high temperature by the immersion heater, and rises to the top of the tank where it collects in a hot layer ready for use. This avoids the interval of time otherwise necessary in waiting for the whole contents of the tank to heat up.

Electrolux, Ltd., showed a new model of the electric cleaner of that name which is claimed to have 40 per cent. greater suction power than that of its predecessors.

The "Electrolux" silent, motorless refrigerator was shown, as was also the "Electrolux" floor polisher. The brushes of the latter are quickly interchangeable, and special rubber buffers obviate all possibilities of damage to furniture or walls.

On the stand of the **British Electrical Development Association** was a good showing of domestic electrical appliances, in addition to a display of newspapers in which advertisements are placed in connection with the Association's national advertising campaign. There was also a display of some of the organisation's well-known posters, while a feature was a continuous kinematograph performance of the latest E.D.A. propaganda film—"Edward and Eda."

Messrs. L. G. Hawkins & Co., Ltd., made a feature of the "Hera" washing machine, which, in some instances, can be fitted with 3-kW heating elements.

Some interesting examples of "Unity" tubular heaters were to be seen on the stand of **Messrs. Young, Osmond and Young, Ltd.** A feature of this equipment is the excellent finishes in which the apparatus is now available, including oak, mahogany, nickel, chromium, &c.

On the stand of the **Horstmann Gear Co., Ltd.**, was shown a range of "Newbridge" automatic electric time switches suitable for both public lighting and for shop-window lighting control. This company also displayed examples of its new 5-A street-lighting time switch, which is claimed to have given remarkable results on test.

Messrs. Archibald Low & Sons, Ltd., had on show a 6-kW electric baking oven for small bakeries; a 6-kW electric bake plate, 36 in. by 25 in., for baking scones, pancakes, &c.; "Highlow" electric automatic storage tanks in various sizes and designs, with the outer casings in various colours of cellulose finish; electric towel rails; a continuous-supply water boiler for supplying boiling water for tea-making, &c.; tubular heaters, including tramway-type models; air warmers; low-temperature hot-water radiators; a water boiler with a safety switch; an automatic egg boiler; a curling-tong heater; electric pots; an automobile heater; immersion water heaters in various sizes and types for fitting into thermal-storage tanks; and temperature control switches.

Overhead Lines in France.

The French Union des Syndicats d'Electricité has decided to organise a competitive series of trials with the object of discovering an effective method of rendering electricity transmission lines non-dangerous in case of rupture. A number of prizes are to be offered for devices judged to best meet the conditions, *viz.*, that of cutting out of circuit all the conductors in a transmission line in case of the rupture of any one of them.

A permanent committee of representatives of aviation and electricity supply undertakings has recently been organised in France to study the problem of the protection of aerial travel in relation to overhead electricity distribution lines.

Legal.

Company Directors Summoned.

AT the Marlborough Street Police Court on Monday last, Wireless Pictures (1928,) Ltd., and its directors, Capt. F. E. Guest, Lt.-Col. Adrian Simpson, Sir Nicholas Gratton-Doyle, Sir Charles Bright, and Mr. W. H. Lynas, were summoned for failing to call an annual general meeting of the company last year. The directors, with the exception of Sir Charles Bright, were also charged with failing to lay a profit and loss account before the shareholders since the company's incorporation. The defendants pleaded "Guilty."

Mr. H. D. ROOME, for the Board of Trade, said that after the expiration of the time for holding the meeting, an application for an extension was made on the ground that an important contract was pending which could not be disclosed. This application was refused. He (Mr. Roome) did not think the case was one for a heavy penalty, but the law must be enforced.

Mr. N. BIRKETT, K.C., for the defendants, said that the offence was merely a technical one, and, in fact, the deferring of the meeting was to the shareholders' benefit. The company operated the Fultograph system of transmitting still pictures, and negotiations had been proceeding for a contract to provide a service of telegraphed pictures to newspapers. This was the contract which was not completed in time for the annual meeting. In addition, complications had arisen in connection with overseas rights. The directors desired him to express their regret that the law had not been complied with.

The magistrate (Mr. Dummett) deferred his decision until the following day.

On Tuesday, Mr. DUMMETT said that he had decided to dismiss the charge against the company on payment of costs. On the first charge against the directors they each would be ordered to pay a fine of £10, with £5 costs; the directors involved in the second charge would be fined similar amounts. The Magistrate said that he recognised that the directors had infringed the law with an honest motive, but breaches of that nature could not be regarded lightly.

Truphonic Radio, Ltd., v. Spero.

IN the King's Bench Division on May 30th, Mr. Justice Branson heard an action by Truphonic Radio, Ltd., claiming £10,370 from Dr. G. E. Spero, until recently M.P. for West Fulham.

It was stated for the company that in 1928 Dr. Spero sold a radio manufacturing business to Truphonic, Ltd., which later sold it to the plaintiff company. Part of the claim (£6,370) arose out of a guarantee given by the defendant with regard to book debts; the rest of the claim represented the amount of a dishonoured cheque given by the defendant to meet two cheques drawn to himself without authority. By stating that he had a counterclaim for £20,000 against the company he had delayed the action for six months and in the meantime had gone to America, where he remained.

His Lordship gave judgment for the amount claimed, with costs.

Ferranti, Ltd.: Increase of Capital Approved.

IN the Lancashire Chancery Court, held at Liverpool on May 26th, Messrs. Ferranti, Ltd., applied for sanction to a scheme for the reorganisation of their capital, involving the creation of 300,000 preference shares of £1 each and 600,000 ordinary shares of 10s. each, raising the total to £900,000.

Subject to slight amendment, the Court approved the scheme. There was no opposition.

Theft of Electricity.

A fine of £5 was inflicted by the Chesterfield magistrates last week on Charles Holmes, Newbold Moor, for fraudulently extracting electricity belonging to the Corporation. It was stated that on visiting Holmes's house an inspector found that a pin had been stuck in each of the supply cables and a piece of flex taken thence to a radiator. The flex was insufficiently insulated and might have caused a serious fire.

K.N. Electrical Products, Ltd.

IN the Chancery Division on May 26th, Mr. Justice Eve made an order for the compulsory winding up of this company. There was no opposition to the order.

Drumm Battery.

A preliminary test of the Drumm battery of a more or less official nature is to take place early in June in the Irish Free State. A passenger car of the Great Southern and Western Railway is being fitted up as a self-contained power-unit for the purpose of the test, and this will be run over a certain section of the railway company's system under various loading conditions. This may be, if the results are satisfactory, a matter of considerable importance in proximate road-traffic orientation.

Correspondence.

Correspondents should forward their communications **as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

The Sales Engineer's Task.

Referring to the above article and the opinions of "C.F.W.," I must state that I am in entire agreement with Mr. S. G. Burdick regarding the last paragraph.

The lack of support given to the E.D.A. by many large undertakings is astonishing, and such examples as the following are not conducive towards an atmosphere of friendly interest.

A small trader occupied new premises for about three months and the s/c fuses blew through no apparent cause. The company, on being duly notified, requested that an outside contractor be called in to confirm the conditions. After considerable delay a representative called and demanded 3s. 6d. before repairing, as the sub-fuse was apparently of the higher rating. The consumer expressing surprise at the lack of inspection, and on notifying the supply company that similar conditions existed on adjoining property received the following acknowledgment:—

"We have to acknowledge your letter of the 7th inst., and regret that it has not been replied to earlier.

"We would point out that this company does not accept responsibility for the condition of consumers' installations, and with regard to the consumer's main fuses in particular, we would say that, even if every fuse in the installation were examined for size before the installation was connected, there is no guarantee that fuses too large would not be put into use subsequently. It is for the consumer to see that his fuses are kept at a lesser capacity than the main supply fuses of the company, otherwise when any trouble occurs the company's fuses will blow instead of the consumer's fuses. This necessitates unnecessary trouble and expense to the company, and does not properly safeguard the consumer's installation, consequently, a charge is invariably made for our inspector's call when it is found that the supply fuses have blown because the consumer's fuses are too large.

"May we point out that our inspector did not alter your main fuses, so that presumably they are still too large.

"We thank you, however, for advising us that similar conditions may exist in adjoining property, and it is unfortunate that it frequently happens owing either to the carelessness or lack of knowledge on the part of the consumer or his contractor. The company, however, cannot take any action in this matter until it automatically discloses itself in the manner in which it did in your case.

"The company's supply fuse blows at 15 amperes, whereas the main fuse you have on your installation blows at 35 amperes. A 10-ampere fuse would be ample to deal with your present requirements."

Such a letter as suggested by Mr. Burdick before the installation is connected would, I am sure, be greatly appreciated in this instance.

G. R. Gilbert West.

Hayes, *May 23rd*, 1930.

Sub-station Attendance.

Great interest has been aroused among station engineers by the recent regrettable fatality in a sub-station, and your leaderette of May 23rd correctly points out that there is really not sufficient work for two men. Apart from that, however, when men are left alone for long periods and have at times to do work in which it is easily possible to make a fatal mistake, it would appear that some different arrangement to that obtaining at present is called for.

It is not only in sub-stations that there is the chance of a man being put out of action and not discovered until some hours later, but in some power stations similar conditions prevail. In one station, having a maximum load of over 15,000 kW, there is only one engineer on duty from midnight to 7 a.m., and, although there are the engine and boiler-house staffs, it might easily be some considerable time before anything wrong was noticed in the event of any sudden indisposition of, or accident to, the engineer-in-charge. It would surely be more satisfactory to have a junior engineer, or switchboard attendant, on duty during the night, as he would be able to carry on temporarily and summon assistance if necessary.

Shift Charge Engineer.

May 27th, 1930.

Electricity Supply Authorities and Radio Apparatus.

I should like to draw attention to what appears to me to be a very misguided attitude on the part of many electricity supply authorities, namely, their lack of interest in mains-operated radio apparatus, which lack of interest in many cases amounts practically to discouraging its use.

The reasons put forward for this attitude are usually that the energy consumed by mains-driven receivers is so small as to be negligible and that the service meter does not measure it.

The average type of mains-operated receiver seldom consumes less than 30 watts and it is a very poor kind of electricity meter that will not measure that amount. Further, radio apparatus is most commonly operated in the evenings at the same time as light is in use, and in consequence the consumption of the radio receiver is added to the general consumption and properly measured.

A very important point which, however, seems generally to be overlooked is that great numbers of people install electricity in their houses in the first case for the facility of operating radio receivers and associated apparatus from the mains and the removal of the bugbear of batteries.

Radio mains apparatus is therefore a direct incentive to the spread of the use of electricity, as when once installed for radio purposes it will obviously be used in many other ways.

J. Baggs.

Manchester, *May 27th*, 1930.

American Vacuum Cleaners.

I was very glad to see some publicity given to the fact that a town councillor was very greatly incensed at receiving a card advertising an American vacuum cleaner with his electrcity account.

It is a fact that a number of undertakings in this country are boosting American and other foreign vacuum cleaners. They seem to go out of their way to exhibit them in prominent places in their show windows and showrooms. I was informed by one Corporation engineer that a certain American company used the electricity undertaking's card as a means of gaining the confidence of the householder, and if a sale was made the undertaking was credited with £3 by the vacuum cleaner company. Obviously, the more foreign vacuum cleaners sold, the less work there is for people in this country, the lower the profits made on English vacuum cleaners, and the less money to buy electricity in the quantities we want it used.

Can anyone imagine American electricity suppy undertakings boosting English goods? It is well known that the Fire Underwriters across the Atlantic for many years have used every endeavour to stop English fittings, &c., being used, but being English, we have to live up to our national trait, namely, that everything foreign is better than everything English, and we must take every step we can to benefit the foreigner to our own detriment. From what I remember according to the Board of Trade returns for 1929, no less than about £1,000,000 worth of vacuum cleaners were imported into this country. This, of course, is only one aspect of the whole question. No wonder we go about with long faces telling ourselves trade is bad. This country seems to ask for most of its troubles.

M.I.E.E.

May 31st, 1930.

The Two-part Tariff.

There is a serious fundamental error in Mr. Bolton's article, which I, as the originator of the system, claim the right to correct. Further, it is both just and necessary, in the best interests of electric supply that the consumers should be protected from the many unfair tariffs now in use, all of which are based on the same erroneous argument.

Electricity cannot be compared with gas and water in its relation to either cost of plant or overhead charges. In the case of gas and water the plant is working usefully all the time it is in action, consumption is drawn from the stored product in the gasholder or reservoir, and a given quantity of that produce actually received. The electric generator functions usefully, so far as each consumer is considered, only when the switch is turned on (storage batteries, of course, excepted). This refers equally to every piece of apparatus irrespective of its nature or time of demand.

For every article connected there are two clearly defined periods: (1) When the switch is off and only costs other than fuel are incurred; (2) when the switch is on and other costs plus fuel are incurred. This simple but accurate view of the position has been almost entirely ignored. The costs of both periods added together become the total costs due for each article connected, while the cost of fuel is determined by the meter. Each article becomes automatically its own price regulator by the time it is used. If used one hour a day it incurs a full day's costs for that hour. If two hours, half a day's costs per hour. If ten hours a tenth of a day's costs per hour, and so on.

The supply engineer is concerned solely with the number of kWh supplied to the mains. Experience shows him what his peak load will be for which he must provide sufficient plant. These are the conditions under which we commenced supply, and, were it not for the criminal neglect of the gas engine, fuel gas would hold good to-day. It is never too late to mend.

The introduction of rateable value into a public supply with which it has no definite relation when an accurate and just tariff is automatically available is abominable.

Ernest G. Pink.

London, S.E.13, *May 30th*, 1930.

Worm-geared Lifts.

Correction.—The third paragraph of Mr. H. Turner's letter in our May 23rd issue should read as follows:—"Taking the particular case, worm gear will overhaul if the thread angle (θ) is greater than the angle of friction (ϕ); that is, if lead/pitch arc is greater than tan ϕ."—Eds. Elec. Rev.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1928.

31,819. "Electrical apparatus for power distribution systems." British Thomson-Houston Co., Ltd. November 1st, 1927. (299,813.)

32,230. "Induction electricity meters." Ferranti, Ltd., and S. Z. de Ferranti. November 5th, 1928. (328,955.)

35,627. "Process for recording the passage of electric currents." R. Pollak-Rudin. December 3rd, 1927 (301,749.)

35,687. "Sound-amplifying devices." W. W. Johnston. March 28th, 1928. (308,769.)

36,279. "Vacuum electric tube devices." E. Y. Robinson and Associated Electrical Industries, Ltd. December 8th, 1928. (328,960.)

1929.

183. "Apparatus for the directional transmission and reception of wave energy." Electroacustic Ges. January 14th, 1928. (304,124.)

241. "Apparatus for the directional transmission and reception of wave energy." Electroacustic Ges. September 4th, 1928. (Addition to 304,124.) (318,509.)

362. "Protective devices for electric machines." International General Electric Co., Inc. January 4th, 1928. (303,484.)

491. "Apparatus for electrical transmission of information." Fabrique d'Appareils Electriques Favarger Soc. Anon. January 6th, 1928. (303,528.)

3,522. "Electric contacts or terminals in electric switchgear arrangements." Switchgear & Cowans, Ltd., and G. H. Neep. February 2nd, 1929. (328,916.)

3,570. "Instruments for recording operation of electric devices." H. R. Cool. February 2nd, 1929. (328,918.)

3,694. "Vibratory or reciprocating electric motors, and cooling devices therefor." C. S. Weyandt. July 19th, 1928. (315,819.)

3,812. "Clockwork-actuated electric switch." P. Saunders. February 5th, 1929. (Cognate application, 8,795/29.) (328,923.)

3,843. "Telephone instruments." Siemens Bros. & Co., Ltd., and W. E. Goodwin. February 5th, 1929. (328,926.)

3,852. "Television systems." Electrical Research Products, Inc. February 24th, 1928. (306,535.)

3,871. "Switch device or make-and-break for electric circuits." R. Newton. February 5th, 1929. (328,927.)

3,895. "Regulation of long-distance alternating current lines." Siemens-Schuckertwerke Akt. Ges. December 5th, 1928 (328,984.)

3,913. "Telegraph transmitting and re-transmitting apparatus." K. L. Wood, W. C. Hubble, H. V. Higgitt, and Eastern Telegraph Co., Ltd. February 5th, 1929. (328,945.)

3,922. "Electrophoretic deposition of solids from dispersions, for example, caoutchouc from latex." Siemens-Elektro-Osmose Ges. February 8th, 1928. (305,630.)

3,923. "Electrophoretic deposition of solids from dispersions, for example, caoutchouc from latex." Siemens-Elektro-Osmose. March 17th, 1928. (Addition to 305,630.) (307,912.)

4,014. "Sound-receiving apparatus." Electroacustic Ges. February 7th, 1928. (305,585.)

4,016. "Protection of electric systems." British Thomson-Houston Co., Ltd. February 9th, 1928. (305,667.)

4,017. "Magneto-electric machines." British Thomson-Houston Co., Ltd., and L. Griffiths. February 6th, 1929. (328,929.)

4,106. "Modified high-frequency circuits for transmitting telephony or like signals." Standard Telephones and Cables, Ltd., and C. H. W. Brookes-Smith. February 7th, 1929. (328,967.)

4,107. "Automatic or semi-automatic telephone exchange systems." Standard Telephones and Cables, Ltd., and E. P. G. Wright. February 7th, 1929. (328,951.)

4,162. "Sound and picture reproducing apparatus." Tonbild-Syndikat Akt. Ges. January 16th, 1929. (328,968.)

4,266. "Electric light and similar fittings." F. E. Bancroft and Associated Electrical Industries, Ltd. February 8th, 1929. (328,973.)

4,316. "Magnet cores for use in loading coils and the like." Automatic Telephone Manufacturing Co., Ltd., and P. N. Rosoby. February 8th, 1929. (Cognate application, 21,621/29.) (328,974.)

4,417. "Arrangement for increasing the resistance to through sparking of discharge tubes." Dr. W. Germershausen. February 14th, 1928. (306,034.)

4,502. "Electric switchgear." A. Reyrolle & Co., Ltd., and A. Allan. February 11th, 1929. (Cognate application, 34,788/29.) (329,020.)

4,618. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., R. Taylor, and C. E. Beale. February 12th, 1929. (329,024.)

4,688. "Impulse senders for automatic or semi-automatic telephone systems." Standard Telephones and Cables, Ltd., and G. Newton. February 12th, 1929. (329,027.)

4,689. "Automatic and semi-automatic telephone systems." Standard Telephones and Cables, Ltd., and E. P. G. Wright. February 12th, 1929. (329,028.)

5,138. "Methods of and apparatus for picture transmission, television or the like." O. Fulton. August 22nd, 1928. (317,778.)

5,140. "Telephone repeater circuit arrangements." Callender's Cable and Construction Co., Ltd., J. Urmston, and F. S. Smith. February 15th, 1929. (Addition to 321,673.) (329,033.)

5,154. "Portable wireless sets." W. M. Holbeach. February 15th, 1929. (329,034.)

5,181. "Methods of, and apparatus for, picture transmission, television, or the like." O. Fulton. February 15th, 1929. (Addition to 317,778.) (329,035.)

5,183. "Fuses, particularly for telephone systems." Standard Telephones and Cables, Ltd. (S. V. C. Scruby, A. Montel, and J. Vial). February 15th, 1929. (329,036.)

5,275. "Power systems." E. M. Johnson, A. Young, and Associated Electrical Industries, Ltd. February 16th, 1929. (329,040.)

5,378. "Secret signalling systems." Siemens & Halske Akt. Ges. February 18th, 1928. (306,407.)

5,801. "Electrical apparatus and means for protecting the same against transients, surges, and the like." F. S. Smith. February 21st, 1929. (329,048.)

6,129. "Electrical heating of buildings and the like." R. Grierson and Grierson, Ltd. February 25th, 1929. (329,055.)

7,252. "Heating elements for electric stoves, radiators, and the like." J. W. G. Pearson. March 6th, 1929. (329,064.)

7,946. "Electrostatic sound reproducers or transmitters." United Reproducers Patents Corporation. November 2nd, 1928. (329,070.)

7,977. "Electromagnetic relays operating on alternating current." Standard Telephones and Cables, Ltd. (C. Chechelovsky and C. Lardot). March 11th, 1929. (329,072.)

8,032. "Electric heating elements." T. Aoyagi. March 12th, 1929. (329,073.)

8,169. "Electrical contacts." Siemens Bros. & Co., Ltd., and E. J. Gachet. March 13th, 1929. (329,075.)

9,157. "Automatic burglar alarms and electrical instruments for use therefor." A. Egal. May 1st, 1928. (310,839.)

9,742. "Arrangement for the simultaneous photographing of animated scenes and recording of sound." L. Mellersh-Jackson (Siemens and Halske Akt. Ges.). March 26th, 1929. (329,093.)

10,644. "Frames for dynamo-electric machines, and methods of making the same." British Thomson-Houston Co., Ltd. April 7th, 1928. (309,186.)

10,839. "Battery hand lamps." National Carbon Co., Inc. May 22nd, 1928. (312,225.)

11,341. "Electrical supply means for use with wireless apparatus." Graham Amplion, Ltd., and A. d'A. Hodgson. April 12th, 1929. (Cognate application, 30,754/29.) (329,113.)

11,544. "Mercury-vapour rectifiers." General Electric Co., Ltd., and E. Weintraub. October 12th, 1928. (329,116.)

11,614. "Thermionic valve amplifying systems." Kolster-Brandes, Ltd., and F. V. A. Green. April 15th, 1929. (329,118.)

12,095. "Overhead conductors for electric tramways and railways." F. W. Fawdry. April 18th, 1929. (329,125.)

12,793. "Portable measuring sets for use on electric transmission lines or the like." American Electric Co., Inc. July 2nd, 1928. (314,792.)

13,470. "Illuminating systems for optical projection apparatus or searchlights." P. Planer and R. Geyling. May 4th, 1928. (310,967.)

13,661. "Electric heaters." C. R. Belling. May 2nd, 1929. (329,142.)

14,403. "Apparatus for comparing electrical capacities." R. F. Dupaquier. September 11th, 1928. (318,885.)

14,452. "Diaphragm units for loud-speakers and the like." W. O. Lawler May 9th, 1929. (329,151.)

14,531. "Thermionic valves or electron-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 15th, 1928. (329,152.)

15,508. "Electrical protective apparatus." Associated Electrical Industries, Ltd. May 17th, 1928. (311,824.)

16,129. "Siemens-Martin furnaces." H. Wade (Terni. Soc. per l'Industria e l'Elettricita). May 24th, 1929. (329,176.)

16,296. "Manufacture of magnetic cores for dynamo-electric machines and the like." J. W. Swendsen. June 2nd, 1928. (312,913.)

16,297. "Electric induction motors." J. W. Swendsen. June 2nd, 1928. (312,914.)

16,337. "Electric welding machines." F. P. McBerty. May 27th, 1929. (329,180.)

17,071. "Vents for electric cells." Pritchett & Gold and E.P.S. Co., Ltd., and H. M. Genese. June 4th, 1929. (329,188.)

17,095. "Automatic telephone systems." Siemens Bros. & Co., Ltd., and D. A. Christian. June 4th, 1929. (329,189.)

17,362. "Method of electrolytically producing insulating layers on articles of aluminium and its alloys." E. W. Kuttner. June 6th, 1929. (329,190.)

19,976. "Electrical condensers and containers therefor." Leclanché Soc. Anon. June 10th, 1929. (329,215.)

20,039. "Sparking plugs for high-compression engines." Soc. Française des Bougies Pognon, M. Pognon et Cie. June 29th, 1928. (314,552.)

21,340. "Control systems for elevators, hoists, and the like." Associated Electrical Industries, Ltd. July 11th, 1928. (315,323.)

22,089. "Train control systems." General Railway Signal Co. July 18th, 1928. (315,805.)

22,293. "Constant potential supply devices for use in alternating current systems." Telefunken Ges. für Drahtlose Telegraphie. July 19th, 1928 (315,844.)

23,378. "X-ray installations." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 11th, 1928. (317,080.)

24,917. "Luminous electric discharge tubes." General Electric Co., Ltd. August 21st, 1928. (Addition to 315,391.) (317,758.)

26,994. "Electric switches." International General Electric Co., Inc. September 8th, 1928. (318,627.)

28,935. "Apparatus for, and methods of, suppressing electric corona." British Thomson-Houston Co., Ltd September 24th 1928. (319,620.)

31,452. "Manufacture of material capable of being marked by electrolytic decomposition." I. G. Farbenindustrie Akt. Ges. October 16th, 1928. (322,258.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from May 28th :—

Phœbus (lettering and design). No. 509,110. Class 6. Dynamos for the lighting systems of bicycles, motor cycles, and motor cars.—La Société Sport, Bienne, Switzerland. (British representatives: Frank B. Dehn & Co., Kingsway House, 103, Kingsway, W.C.2.)

Figure of Pan (design only). No. 503,177. Class 8. Radio-telephonic and telegraphic apparatus and parts thereof.—Pandona, Ltd., 184, Aston Road, Birmingham.

Heleco. No. 501,440. Class 8. High-tension batteries, dry batteries, aerials, low-frequency transformers, variable condensers, and high-frequency chokes, for use in radio-telephony and telegraphy.—M. J. Wass, trading as the Heleco Radio Co., 19-20, High Street, Shoreditch, E.1.

Aeroficient, No. 505,692, and Electroficient, No. 505,693. Class 8. Radio-telephonic and telegraphic instruments and parts thereof.—Graham-Farish, Ltd., 153, Mason's Hill, Bromley, Kent.

Lyric. No. 508,868. Class 8. Radio and television receiving sets and component parts thereof.—All-American Mohawk Corporation, Chicago. (British representatives: McKenna & Co., 31-34, Basinghall Street, E.C.2.)

Voice in the Air. No. 508,892. Class 8. Sound amplifying apparatus, amplifying and rectifying valves, radio-telephonic apparatus and parts thereof.—Grigsby Grunner Co., Chicago. (British representatives: White, Langner, Stevens, Parry & Rollinson, 5-9, Quality Court, Chancery Lane, W.C.2.)

Agile. No. 510,324. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Otto Simonis, 16, Upper Hamilton Terrace, St. John's Wood, N.W.5.

Pantheon (lettering and design). No. 511,081. All goods in Class 8.—Harry Panagakis, 19, Manchester Street, Liverpool.

Decca (lettering and design). No. 511,153. Class 8. Radio-telephonic and other signalling apparatus and instruments, parts thereof, and accessories.—Decca Record Co., Ltd., 1-3, Brixton Road, S.W.9.

Sternet. No. 511,247. Class 8. Radio-telephonic apparatus, &c.—British Homophone Co., Ltd., 67-69, City Road, E.C.1

Lissen. No. 512,103. Class 8. Electric accumulators and batteries (not for medical purposes).—Lissen, Ltd., Worple Road, Isleworth, Middlesex.

The Pilot Long Life Battery. No. 511,281. Class 8. Batteries for use in small flash lamps.—William Twist & Sons, 19-27, Market Street, St. Helens, Lancs.

Coltagraph. No. 512,125. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—W. H. Colt & Co., Ltd., Bush House, Aldwych, W.C.2.

Philips Argenta. No. 510,116. Class 13. Electric lamps (ordinary).—Naamlooze Vennootschap Philips' Gloeilampenfabrieken, Eindhoven, Holland. (British representatives: Boult, Wade & Tennant, 112, Hatton Garden, E.C.1.)

Lacent. No. 510,887. Class 13. Electric light fittings.—Heyes & Co., Ltd., Water-Heyes Electrical Works, Wigan, Lancs.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ASHTON-UNDER-LYNE.—Fire station and public offices, with heating and electrical work (£18,000), for the T.C.; W. H. George & Son, architects.

BARNSLEY.—Houses (150) for the T.C.; borough surveyor.

BATH.—Telephone exchange, Weston, for H.M. Office of Works, King Charles Street, London, S.W. (returnable deposit of £1 1s.).

BEXHILL.—Houses, Cooden Drive; Tubbs & Messer, Endwell Road. Houses, Barnhorn Road and "The Broadwalk; G. E. Matthews. Swimming bath, Collington Lane; A. G. Wright.

BIRKENHEAD.—Houses (278), Bebington Road; R. W. Johnston, borough engineer, Town Hall (deposit £2 2s.). Hotel, Borough Road and Prenton Road West, Prenton, for Birkenhead Brewery Co., Ltd. (£20,000); A. Norman Coveney, architect.

BIRMINGHAM.—Cinema, Alum Rock Road, Saltley, for Leon Salberg, Westmount, Vicarage Road, Edgbaston. Cinema, Pershore Road and Cartlands Road; Horace Bradley, architect, 10a, Temple Row. Factory, Farm Street, for Joseph Lucas, Ltd., Great King Street; Wilkinson, Ltd., builders, Hutton Road, Handsworth.

BOOTLE.—Cinema, Stanley Street; Hurley Robinson, architect.

BROMLEY.—Extensions, poor law institution (£51,000): Kent C.C.

BURNLEY.—Extension of the Municipal College (£18,000): borough engineer.

BURY ST. EDMUNDS.—School (480 places) for the borough E.C.; J. H. Wakefield, secretary.

CARLISLE.—Schools and extensions (£358,401) for the E.C.; F. Ashton, director of education.

CHAPELTOWN (NEAR SHEFFIELD).—Alterations and additions, Chapeltown Picture Palace, Station Road, Chapeltown; E. Bryan Dean, architect, Market Chambers, Mansfield.

CHESTER.—Houses (200), Corporation estate; city engineer.

CHESTERFIELD.—Houses (50), North Wingfield, for the R.D.C.; housing architect.

CHORLEY.—Houses (90), Springs estate; C. R. Bradley, Bacup.

CLYDEBANK.—Public baths, with electrical and heating installations; J. W. Johnston, town clerk (deposit £1).

CREWKERNE.—Post office and telephone exchange; Symes and Madge, architects, Somerset House, Chard.

DEVIZES.—County offices for Wilts. C.C.; county surveyor, Trowbridge.

EDGWARE.—Shops (40), Watling Avenue, Burnt Oak; W. Newcome Wright, architect.

EDINBURGH.—Extensions of Hospital for Crippled Children, including administrative block and nurses' residence; medical superintendent, Frogston Road.

EPSOM.—Sanatorium at Epsom College (£25,000).

FLEETWOOD.—Public hall and ballroom to accommodate 1,000, Poulton Road; R. Roskell, architect, Birch Street.

GLASGOW.—Hotel, Buchanan Street, with lifts and central heating (£50,000); N. Macwhannell, architect, 309, West George Street.

HANWELL.—Cinema; G. B. Carter, architect.

HERNE BAY.—Houses (51), Herne Road and Mickleburgh Avenue; Herne Bay Estates, Ltd.

HULL.—Houses (300) for Sutton trustees; North & Andrew, architects.

IRISH FREE STATE (BALLYMAHON, CO. LONGFORD).—Dean Egan Public Library for the trustees; V. Kelly, architect, 87, Merrion Square South, Dublin (returnable deposit of £3 3s.).

IRVINE (N.B.).—Housing scheme (80); burgh surveyor.

KENT.—School, Gillingham, for the borough E.C. (£36,266); R. J. Barwick, builder, Dover.

KIRK ELLA (YORKS.).—Electric lighting installation, Parish Church; Canon James Foord, vicar.

LEEDS.—Municipal offices; city engineer.

LEICESTER.—Secondary school St. Mary Street (£22,000); A. E. Tate, contractor to E.C.

LIVERPOOL.—Council school, Whitefield Road (£23,000); Unit Construction Co., Ltd., builders.

LONDON (ILFORD, E.).—Cinema, Eastern Avenue, Gantshill; Clarke, Son & Grant.

LONDON—*continued.*

(E.C.).—Buildings for Sir John Cass Technical Institute (£66,000); governors.

(HENDON, N.W.).—Houses (156), Stanmore, and other sites; R.D.C. surveyor. Extensions, Isolation Hospital; U.D.C. surveyor.

(NORWOOD, S.E.).—Elementary school, Beulah Hill (£29,864); F. R. Hipperson & Sons.

(GREENWICH, S.E.).—Houses (109) for the T.C.; Corolite Construction, Ltd., builders, Shaftesbury Avenue, W.C.

(KENSINGTON, S.W.).—Remodelling West Kensington Central School (£39,000); L.C.C. architect. Cinema, Fulham Road and Drayton Gardens; Stanley Beard and Clare, architects, Baker Street, W. Extensions, Belgrave Hospital; Adams, Holden & Pearson, architects. Geological museum, Exhibition Road; H.M. Office of Works.

(STREATHAM, S.W.).—Tenements, Leigham Court Road (£165,000); central school, Furzedown; L.C.C. architect.

(BRIXTON, S.W.).—Remodelling of Effra Parade school (£23,500); L.C.C. architect.

(EALING, W.).—Houses (30), Oldfield Lane; F. H. Shearley. Houses (26), Eastcote Avenue; R. Lancaster and Sons. Houses (80), Bruton Way, Claremont Road, Fosse Way, and Vallis Way; G. Wimpey & Co., Ltd. Houses (60), Wood End Lane, Ealing Road, Northolt, and Greenford Road; W. R. Davidge, architect, 5, Victoria Street, S.W.1. Second block, Coston school (£11,636; W. J. Dickens, contractor, Ealing.

(ST. MARYLEBONE, W.).—Cumberland Hotel, Oxford Street and Cumberland Place; F. J. Wills.

LUTTERWORTH.—Re-erection of Empire Cinema, Market Street, for Tanner & Crowdy, Rugby.

MANCHESTER.—Ice skating rink, Rusholme; Peter Cummings, architect.

MINEHEAD (SOMERSET).—Cinema; J. A. Lawrence, architect.

MORPETH.—Hospital, Walton Road, for the governors of the Cottage Hospital, King's Avenue; C. F. Murphy, architect, Newgate Street, Morpeth.

NELSON.—Houses (78), Hodge House estate; borough surveyor.

NEWPORT (MON.).—Secondary school (1,000 places); C. F. Ward, borough architect.

NEW SOUTHGATE.—Cinema; R. Crombie, architect.

PORT TALBOT.—Ward at the General and Accident Hospital, Sandfields; Gibb & Smith, architects, Post Office Chambers.

ROMSEY.—Buildings for Cottage Hospital (£12,000); Mr. Gutteridge, architect.

SALE.—Extensions, Town Hall and Library, Tatham Road, for the Sale U.D.C. (£15,000); Adshead, Topham and Adshead, architects, 14, St. Ann's Square, Manchester.

SEDGEFIELD.—Additional 250 houses for the R.D.C.; surveyor.

SHIPLEY.—Houses (89), Carr Lane and Wood Top; Mr. Dawson, architect to U.D.C.

SHREWSBURY.—Additional 70 houses for the T.C.; borough surveyor.

SLOUGH.—Houses (648) for Gradwell & Co., Ltd.

SOUTHEND-ON-SEA.—Greyhound racing track and ice skating rink; S. Rose.

STAMFORD.—Houses (68) for the T.C.; J. W. Barber, builder, Stanground, Peterborough.

STAMFORD HILL.—Tenements (£185,000); L.C.C. architect.

SUNDERLAND.—Cinema; Blacks Northern Theatres.

SWINDON (WILTS.).—Houses (90), Hurst, for the T.C.; J. B. L. Thompson, borough surveyor.

TAUNTON.—Theatre (£20,000), for Albany Ward Theatres, Ltd., 47, Cranbourn Street, London, W.C. Offices and clinic for the T.C.; Samson & Colthurst, architects, Hammet Street.

TIMPERLEY.—Rebuilding Pelican Hotel, Manchester Road, for Messrs. Groves & Whitnall, Ltd. (£20,000); Col. G. Westcott, architect, 13, Bridge Street, Manchester.

WELLINGBOROUGH.—Baths (£25,000); U.D.C. surveyor.

WHITEFIELD.—Housing scheme (220); surveyor to U.D.C. (deposit £2 2s.).

WILLESDEN.—Extensions, secondary school (£32,908); C. J. Newby Bros., Southgate.

WOLVERHAMPTON.—Cinema; Satchwell & Roberts, architects, 6, New Street, Birmingham.

YEOVIL.—Housing scheme (60) for the R.D.C.; Petter and Warren, architects, Old Sarum.